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THE VOICE

THE VOICE

Its Production, Care and Preservation

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By

FRANK E. MILLER, M. D.

With a Note by

GUSTAV KOBBÉ

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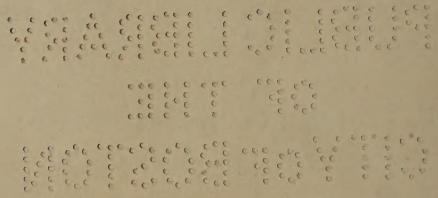

Note

Dr. Frank E. Miller, the author of this book, is one of the leading New York specialists on throat, nose and ear. He numbers many singers among his patients and is physician to the Manhattan Opera House, Mr. Oscar Hammerstein's company.

To expert knowledge of the physiology of the vocal organs he adds practical experience as a vocalist. Before and during his student years he was a singer and held, among other positions, that of tenor in one of the large New York churches. This experience has been of great value to him in his practice among singers. He understands them temperamentally as well as physically. Moreover, it has led him, in writing this book, to consider questions of temperament as well as principles of physiology. Great as is the importance that he attaches to a correct physiological method of voice-production, he makes full allowance for what may be called the psychological factors involved therein—mentality, artistic temperament, correct concept on the part of the singer of the

pitch and quality of the tone to be produced, etc.

Above all, Dr. Miller, while convinced that the tones of the vocal scale require, for their correct emission, subtly corresponding changes of adjustment in the vocal organs, utterly rejects anything like a deliberate or conscious attempt on the singer's part to bring about these adjustments. He holds that they should occur automatically (or subconsciously) as the result, in very rare instances, of supreme natural gifts, in others as a spontaneous sequence to properly developed artistry.

In fact, while based on accurate scientific knowledge, Dr. Miller's book also is the outcome of long observation and experience, so that it might well be entitled "The Common Sense of Singing."

GUSTAV KOBBÉ.

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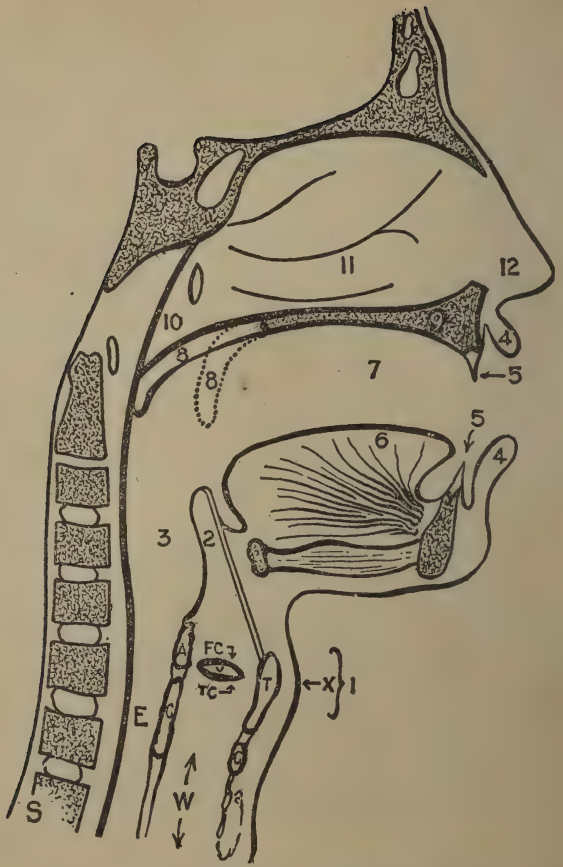


Fig. 1. The Throat and Adjoining Structures

1, Larynx. 2, Epiglottis. 3, Lower Pharynx. 4, Lips. 5, Teeth. 6, Tongue. 7, Mouth (Oral Cavity). 8, Uvula and Soft Palate. 9, Hard Palate. 10, Upper Pharynx. 11, Nasal Cavities. 12, Nose.

A, Arytenoid Cartilage. C, Cricoid Cartilage. T, Thyroid Cartilage W, Windpipe. X, Adam's Apple.

CHAPTER I

A RATIONAL VOCAL METHOD

SONG, so far as voice-production is concerned, is the result of physiological action, and as voice-production is the basis of all song, it follows that a singing method, to be correct, must be based on the correct physiological use of the vocal organs. The physiology of voice-production lies, therefore, at the very foundation of artistic singing.

The proper physiological basis for a singing method having been laid, something else, something highly important, remains to be superimposed. Voice is physical. But everything that colors voice, charging it with emotion, giving it its peculiar quality and making it different from other voices, is largely, although not wholly, the result of a psychical control—a control not exercised mysteriously from without, like Svengali's over Trilby, but by the singer himself from within. Every singer is his own mesmerist, or he has mistaken his vocation. For while voice is a physical manifestation, its "atmosphere," its emotional thrill and charm, is a psychical one—the result of the individual's

thought and feeling, acting unconsciously or, better still, subconsciously, on that physical thing, the voice.

Between the two, however, between mind and body, there lies, like a borderland of fancy, yet most real, the nervous system, crossed and recrossed by the most delicate, the most sensitive filaments ever spun, filaments that touch, caress, or permeate each and every muscle concerned in voice-production, calling them into play with the rapidity of mental telegraphy. Over this network of nerves the mind, or—if you prefer to call it so—the artistic sense, sends its messages, and it is the nerves and muscles working in harmony that results in a correct production of the voice. So important, indeed, is the coöperation of the nervous system, that it is a question whether the whole psychology of song may not be referred to it—whether the degree of emotional thrill, in different voices, may not be the result of greater or less sensitiveness in the nervous system of different singers. This might explain why some very beautiful voices lack emotional quality. In such singers the physical action of the vocal organs and of all the resonance cavities of the head may be perfect, but the nerves are not sufficiently sensitive to the emotion which

the song is intended to express, and so fail to carry it to the voice.

Immense progress has been made in anatomical research, and in no other branch more than in the study of the throat and of the larynx, which is the voice-box of the human body. There also has been a great advance in the study of metaphysics. It would seem high time, therefore, that both the results of modern anatomical study and the deductions of advanced psychological research, should be recognized in the use of that subtle and beautiful thing, the human voice, which in its ultimate quality is a combination of physiological and psychological phenomena—the physical, voice-producing organs acting within and for themselves, but also being acted upon by a series of suggestive impulses from the mind and soul, countless in number and variety. Indeed, one might say that while in singing the vocal organs are the first essential, they must, in order to achieve their full effect, be in tune with the infinite. Artistic singing involves complete physiological control of the voice-producing function, combined with complete command of the metaphysical resources of art. Thus only can voice be produced with that apparent spontaneity which we call artistic, and at the same

time be charged with the emotional quality which gives it individual significance.

These two factors of voice-production, the physical and the psychical, should be recognized both by the teacher and by the student in striving to develop the voice, and by the physician who seeks to restore an impaired voice to its pristine quality. The substitution by teachers of various methods, originated by themselves, for the natural physiological method to which the vocal organs become self-adjusted and for the correct processes of auto-suggestion originating within the well-taught singer himself, is the cause of most ruined voices. The physician who realizes this will, in treating an impaired voice, know how to maintain the proper balance between the two factors—between medicine and surgery on the one hand and considerations of temperament and mentality on the other.

There have been written books on voice-method of which "be natural" is the slogan; books on the physiology of voice-production, in which, as far as the singer is concerned, too much importance is attached to the results of laryngoscopic examination; and books on the psychology of voice-production in which the other factors are wholly neg-

lected. None of these three varieties of book, however, covers the ground, but each only a part of it. The three—nature, physiology and psychology—must be combined in any book that professes to offer a synthetic method of voice-production.

It is possible that knowledge of the structure of the vocal organs is of more importance to the physician and to the teacher than to the singer himself, and that too constant thought of them might distract the latter's attention from the product to the machine, from the quality of voice to be produced to the vocal apparatus producing it. Nevertheless, some knowledge of the organs which he brings into play in singing cannot fail to be helpful to the vocalist himself, and surely their importance to the teacher of singing and to the physician who has an impaired voice to restore cannot be overestimated. Correct teaching, in fact, directs the mind to the end, and by taking into account the physical parts concerned in singing, imparts to them the habit of unconsciously obeying natural laws. Singing may not be a question of how a distorted throat looks in an oblique mirror, yet the knowledge that, because a note is faultily produced, the throat must

be distorted, and how, will be of great service to the teacher who wishes to correct the fault, and indispensable to the physician who wishes to eradicate the results of a bad method. The very first principle of a vocal method should be, to establish so correct a use of the vocal organs that nature in this respect becomes second nature. For correct action of the voice-organs can develop into a habit so perfectly acquired that the singer acts upon it automatically; and the most disastrous result of poor teaching is that a bad habit also becomes second nature and is almost impossible to eradicate.

There seems to be no question but that the old Italian masters of singing, whether knowingly or unknowingly, taught according to correct physiological principles, and that, because of a neglect of these principles since then, while there has been a general advance in everything else, the art of voice-production actually has retrograded. For not only did the old Italian masters understand the voice in its physical aspects; they also insisted, because they understood it so well, on a course of voice-training which lasted long enough to give the pupil complete ease and entire control of technic. The story of the famous master, Por-

pora, and his equally famous pupil, Caffarelli, is worth recalling. On a single sheet of music paper Porpora wrote all the feats of which the voice is capable, and from that one sheet Caffarelli studied with him five, some say six years. Then the great master dismissed him with these words: "Go, my son, I have nothing more to teach you; you are the greatest singer in Italy and in the world." In our own hurried days the teacher is only too apt, after a few months, or even after only a few weeks, to say: "Go, my dear. You know *enough.* You are pretty to look at, and you'll make a hit!" For, curiously enough, while the student of the pianoforte or the violin still will devote years to acquiring perfection upon it, a person who thinks himself gifted with a voice expects to become a singer with a year or two of instruction, possibly even after studying only a few months. Yet the apparatus concerned in voice-production is a most delicate one, and, being easily ruined when incorrectly used, haste in learning how to use it not only is absurd but criminal—voice-murder, in fact.

It has been said that one error of the old Italian method was that it concerned itself only with beautiful tone-production, whereas real singing is the vitalization of words by emotion. But the

vitalization of words by emotion may well follow upon beautiful tone-production and, though in the case of the old Italians this undoubtedly was aided by the smoothly flowing quality of the Italian language, a singer, properly taught, should be able to sing beautifully in any tongue.

Besides haste, one great danger to-day to the art of singing, and especially to the art of beautiful tone-production, which lies at the root of all beautiful singing, is the modern worship of individualism, of the ability of a person simply to do things differently from some one else, instead of more artistically, so that we are beginning to attach more importance to whims and personality than to observance of the canons of true art. It is only when the individual has supreme intelligence, that any such disregard of what constitutes true art should be tolerated. Henry Irving, for example, was extraordinarily effective in certain rôles, while in others his acting was atrocious. But even in these latter there was intellect behind what he did, and the spectator became so interested in observing his manner of striving for an effect, that he forgave him for falling short of what he strove for. But this is a very exceptional and a very dangerous kind of precedent. Art ever

is more honored in the observance than in the breach. Yet its breach often is honored by modern audiences, and especially operatic audiences, because they tend to rate temperament too high and art too low, and to tolerate singers whose voice-production is atrocious, simply because their temperament or personality interests them. Take a case in point: The Croatian prima donna, Milka Ternina, whose art ranges from Tosca to Isolde, sings (in "Tosca") the invocation to the Virgin which precedes the killing of Scarpia, with a wealth of voice combined with a power of dramatic expression that simply is overwhelming; and she acts the scene of the killing with sufficient realism to raise her entire performance to the highest level of vocal dramatic art. An Italian prima donna who has been heard in the same rôle at the same opera house sings the invocation wretchedly, but acts the following scene, the killing of Scarpia, with startling realism. She wins applause for her performance, as much applause as the other, which shows that an operatic audience will not only tolerate, but even applaud a singer who substitutes physical attractions, temperament and a peculiar wriggle of the spinal column for beautiful voice and correct method.

We all possess voice-mechanism, and possibly there is no other physical apparatus that is misused so much. Americans misuse it even in speech; yet what a valuable possession is an agreeable and pleasant speaking-voice. This abuse of the vocal organs by the great majority of Americans makes the establishment of a correct method of voice-production in this country all the more desirable. Yet, what do we find here? Almost any charlatan can set up as a singing-teacher, and this despite the fact that the voice-mechanism is a most delicate and subtle structure, and that a slight physical disturbance or wrong use of it seriously affects the quality of the voice produced.

Had I not been a singer before I became a physician, I might not realize the part that nature, properly guided, plays in the use of the voice. Had I remained a singer and not become a physician, I might not realize how important an aid in properly guiding nature in the use of the voice is a scientific knowledge of the action of the voice-producing organs. Had I not been a singer and were not now a physician, I might not realize the influence upon the artist's physical well-being, and especially upon that delicate apparatus, the voice-

mechanism, of temperament, mental condition and other purely metaphysical factors. This book, then, while it believes in consulting nature, does not believe in that "natural" method which simply tells you to stand up and sing; nor does it believe in that physiological method which instructs you to plant yourself in front of a mirror and examine your throat with a laryngoscope; nor in advising you to follow minutely the publications of the Society for Psychological Research. It believes in a synthetic coördination of the three. In my practice I have become convinced that every impairment of the voice is due to outraged nature, resulting in a physiological condition of the vocal organs that should not exist, and, in turn, inducing a psychological condition, such as worry and despondency, which also should not exist. By discovering with the aid of the laryngoscope the physiological defect and removing it, body, and, with it, mind and voice are restored to their proper condition. But if the singer goes back to a teacher whose method is wrong, the same impairment, or even worse, will result.

Jean de Reszke is a perfect example of how a singer can develop his voice when he turns from a wrong method to a right one. This celebrated

tenor actually thought he was a baritone, and so did his teacher. He was trained as a baritone, made his début in a baritone rôle and sang as a baritone for several years. But he experienced great fatigue in singing, much greater fatigue than seemed proper or necessary. This led him eventually to have his voice tested by another teacher, who discovered that he was a tenor. Singing with the wrong voice, which also means with a wrong method, had exhausted him. As a tenor his beautiful voice-production, based on a correct physiological method, made him equally at home and equally at ease in rôles making the most opposite demands upon his powers. He sang equally well in Gounod and Wagner; and in Wagner, whether he was singing the young Siegfried, Siegfried of "Götterdämmerung," or Tristan.

The proper coördination of all the parts of the physical vocal apparatus with the powers of mind and emotion, is what in the end constitutes the perfect singer, and that proper coördination has, as its first basis, a due regard for the physiology of voice-production as well, of course, as for the general rules of health. In Gilbert and Sullivan's "Mikado," Nanki Poo, hearing a tomtit by the river reiterating a colorless "tit willow," asks the

bird if its foolish song is due to a feeble mind or a careless diet.

"Is it weakness of intellect,
Birdie," I cried,
"Or a rather tough worm
In your little inside?"
But all that the dear little birdie replied,
Was, "Willow, Tit Willow, Tit Willow."

Colloquially expressed, what Mr. Nanki Poo asked the bird was as follows: "Being gifted by nature with a perfect larynx, which should enable you to sing beautifully, do you confine yourself to singing a colorless 'Tit Willow' because you don't know any better, or because you are attempting to sing on top of an improperly selected meal?" In other words, he put violation of the laws of hygiene by a singer on a par with idiocy. Thus, even from comic opera, in the performance of which most of the rules of vocal art are violated, one yet may gather certain truths—by listening to the words—provided the singers know enough to enunciate them distinctly.

The physiology of voice-production not only offers a rational method, it also enables the student to guide his own development, to advance his physical welfare, and, because he knows the why

and wherefore of things vocal, to perceive what is best in the performance of others and to profit by it. Moreover, correct method of voice-production is in itself a health developer, and a singer who is taught by it often is able to overcome the disadvantages of a poor physique; while a singer, originally of strong physique, may find himself physically weakened by the use of a faulty method.

As between a person who employs a beautiful voice artistically and a person who sings less beautifully, relying chiefly on interesting personality and temperament, instead of on correct method, the former singer usually long outlasts the latter. In other words, genuine vocal art is the crowning glory of a naturally beautiful voice.

CHAPTER II

THE CHOICE OF A TEACHER

FURTHER observations of a general character may be allowed to precede a more detailed consideration of method.

Some people wonder why a person who is gifted with voice simply can't get up and sing without any instruction. The reason is that voice is an instrument; a natural, human instrument, it is true, yet one in the use of which the fortunate possessor requires practice and training. The purpose of a singing-method is to produce a perfect coördination of all parts of the human voice-producing mechanism, an apparatus which is by no means simple but, in fact, rather intricate and complicated. It will be found, for example, that such a natural function of life as breathing has to be especially adapted to the requirements of the singing voice; that breathing such as suffices for the average person will not suffice for correct voice-production. Again, in every voice certain notes are better than others, and a correct method of voice-production, while it may not be able to make

every note in the range of voice of equal quality, brings the whole voice up to a more even standard of excellence. It leaves the best notes as good as ever and brings the notes which naturally are not so satisfactory, nearer the standard of the best. The great singers, in addition to natural aptitude, remain students throughout their careers.

There are certain fundamental principles in a correct method of voice-production, for it is based upon study and knowledge of the organs concerned therein. But if the method were a hard-and-fast one, it would not be correct. For there are so many individual differences, physical and temperamental, between pupils, that there must be elasticity and adaptability in a method that claims to produce the best results.

Knowledge and experience should be combined in a teacher. Garcia wrote a voice-manual; and Tosi published a method as far back as 1723. But a teacher who has bought a translation of the "Traité complet de l'Art de Chant" by no means is a second Garcia, nor has a teacher who chances to have read Tosi's book a right to set himself up as an instructor of singing after the old Italian method. The old Italians, like Tosi and Porpora, were men of great practical experience in teaching,

and they understood how to adapt method to individual needs. Consciously or unconsciously, their method was physiological—the fundamental principles of the physiology of voice-production were there; but these great teachers knew that individual differences had to be allowed for and that a singing-method is not a shoemaker's last.

Sometimes, indeed, it is the pupil who makes the master. One of those born singers, man or woman, whom Nature has endowed with superlative gifts and whom some unknown yet meritorious teacher, perhaps in America, has started aright, goes abroad and, after a while, comes forth, not made, but fortunately not marred, from a foreign vocal studio and enters upon a great career—and the foreign teacher's fame becomes international. The real foundation for that career may have been laid in an American city. But ambitious young Americans, instead of seeking out that teacher, will flock to the foreign one.

In such matters we are the most gullible people on the face of the earth. An Italian, now dead, but in his day the most high-priced singing-teacher in London, used to devote the greater part of his lesson periods to telling his pupils how fond cer-

tain members of the English Royal family were of him and to pointing out the souvenirs of their favor which he had displayed in his studio. Yet, doubtless, his pupils thought that, all the while they were listening to his chatter, they were taking lessons in voice-production! Americans dearly love a foreign name, and especially an Italian one, when it comes to selecting a singing-teacher. But all is not gold that glitters, and the fact that a teacher writes "Signor" before his name does not necessarily signify that he is Italian, but often only that he would like people to believe he is, because there is a foolish belief that every Italian teaches the old Italian method. The famous Mme. Marchesi, in spite of her name, is not Italian. She acquired it by marriage to Salvatore Marchesi, an Italian baritone. Before that she was Fräulein Mathilde Graumann, a concert singer of Frankfort-on-the-Main; and sometimes I wonder whether, if she had remained Fräulein Mathilde Graumann, she ever would have become the famous teacher she is. But Marchesi she is, and famous; and I do not doubt justly so. Yet even the pupils of so famous a teacher differ regarding the value of her method. Thus Melba never fails to sing her praises. On the other hand, Emma Eames, knowing that she

was speaking for publication and that a stenographer was taking down her words, said: "Mme. Marchesi is a thoroughly good musician. Any one who goes to her with an established voice can learn a great deal from her in the interpretation of many rôles. She is an admirable teacher of expression and of the general conception of a character. As a drillmaster she is altogether admirable. She teaches you the value of utilizing your time, and she makes you take a serious view of your work, which is important, for hardly an American girl who goes to her has an idea of studying seriously. She also is capital at languages. But when it comes to voice-development, I consider that she fails. My voice naturally was broad and heavy. After the end of the first two years' study with her I could not sing A without difficulty. She did not seem to know how to make my voice light. It was getting heavier and less flexible all the time."

Some years ago Mme. Marchesi's daughter, Mme. Blanche Marchesi, appeared on the concert stage in New York. As the daughter and pupil from childhood of her famous mother, she was supposed to be an ideal exponent of the Marchesi method. Professional singers and instructors

flocked to her first concert. It was to be an experience, an object-lesson. Well—it was. They saw a fine-looking woman with a mediocre voice and a worse method, a method so hopelessly bad that even her undoubted musicianship could not atone for it.

All this goes to prove that a method, to be elastic and adaptable, should be based on a knowledge of the physiology of the voice-producing organs, for such a method naturally adapts itself to physical differences in different individuals. Without doubt Mme. Marchesi's method was admirably adapted to Melba, but not to Eames or to her own daughter.

Bear these circumstances in mind in selecting a teacher. The great singers are not always safe guides in the choice of a teacher, because their own superlative gifts and willingness to slave for the object of their ambition may have been as important factors in their success as the instruction they received. Probably a singer of only fair natural gifts who yet has made a success—which shows that he must have been well taught—can give better advice as to the choice of an instructor than the great artist who owes so much to himself. Moreover, great artists who have studied with the same

teacher will, like Melba and Eames, differ in their estimate of that teacher.

There is, however, one great singer, Lillian Nordica, who knows to whom to give credit for that skill in voice-production which enables her to sing Valentine, Aida and Isolde with equal success. The foundation for her career was laid in this country. Afterward she studied with Mme. Maretzek and in Milan with San Giovanni, but only interpretation. Her voice-production she acquired not from Madame this or Signor that, but from plain John O'Neill, of Boston, "a scholarly man who had made a profound study of the physiology of the voice," and she took good care not to allow any other teacher, however "famous," to undo the work of the man who had taught her voice-production based on correct knowledge of the physiology of the voice-producing organs.

This matter of choosing a teacher is, of course, of the greatest importance, but it barely can be touched on in this book. The selection should be made most cautiously, but, once made, the pupil's parents should not go to the teacher a few weeks later and ask, "Why don't you give Clara some 'pieces'?" They should recall the story of Porpora and Caffarelli which I related in the previous

chapter. "Pieces" are not in order until the voice is prepared for them, and the teacher is the best judge of that. A voice trained on "pieces" soon goes to pieces.

Another mistaken idea is that "any teacher is good enough for a beginner," whereas the beginning is the very time that the foundation of right method or wrong method is laid. Classifying the voice is, of itself, of great importance. Remember that Jean de Reszke's first teacher thought he was a baritone and that he sang as a baritone in opera for five years before a more competent teacher discovered that he was really a tenor. Some voices are so near the dividing line that it requires wide experience and a fine ear for quality on the part of a teacher to determine in what direction they should be developed to greatest advantage. A fine ear may determine that the seeming mezzo is a true soprano, that the notes of the pupil who comes as a baritone have the tenor quality and that his scale safely can be added to, while the would-be tenor has the baritone timbre which will prevent his notes from ever ringing out with the true tenor quality. Yes, this initial task of voice classification is far too important to be entrusted to "any teacher."

There are piano-thumping teachers of voice, who not having voices themselves are obliged to give their pupils the pitch of each note by pounding it out on the pianoforte. Voice quality has nothing in common with pianoforte quality of tone, yet constant thumping of the pianoforte by a singing-teacher in order to give the pupil the pitch, is apt to mix pianoforte color into a pupil's voice and mar its translucent vocal quality. A teacher need not be a fine singer—few vocal teachers are—but, at least, he should be able to give pitch vocally and to suggest with sufficient definition the quality of tone the pupil is to produce.

At what age should singing-lessons begin? Some say the earlier the better. Others hold that, under no circumstances, should a boy or girl be taught to sing before the age of puberty, before the voice has mutated. Those who believe that singing can be taught in childhood and safely continued even during the critical period of mutation, point out that the muscles of the voice-producing organs are most flexible and adapt themselves most easily to the task in hand during childhood and that the process of training them had best begin then, and that, with proper care, the lessons can be continued during the period of mutation.

My own opinion is that this period is so critical and proper care is so apt *not* to be taken, that the safest rule is not to begin singing-lessons until the adult voice undisputably has arrived. So many voices have been ruined by lack of care during mutation that it is better no risk should be taken. But why not, it may be asked, have the child taught and, when the period of mutation arrives, have the lessons suspended? There would be no harm in this, excepting that here again is run the risk that proper care will not be taken to stop soon enough and that the career of a possibly fine singer may be ruined. It has happened again and again that voices have been lost irretrievably or impaired permanently by careless use of them during the change from youth to manhood. Therefore, and also because the muscles remain limber and flexible in young people for some years after they have arrived at puberty, I advise that singing-lessons should not begin until the period of mutation is well over. Sir Morell Mackenzie, after stating that the doctrine long has been held universally that not only should systematic training be interrupted, but singing altogether forbidden during that critical period, nevertheless maintained that "*if due care is exercised* there is no reason why the

voice should not be used in singing during the transition period: but the training must be carried out *within certain limits and under strict supervision by a competent person.*" But there is so much risk that due care will not be exercised, that those "certain limits" will be overstepped, that the "strict supervision" will be relaxed or not exercised by a "competent person," that I strongly advise not to begin lessons until the period of change is over.

In this view I am supported by Garcia, who took sharp issue with Mackenzie. "My father," wrote Garcia, "went through the transition time without ceasing to sing, and without having done himself the least harm. But both my sisters, Mesdames Malibran and Viardot, were obliged to wait a year. I continued to sing, and my voice was ruined!" Continuing, Garcia says that the old rule which has preserved so many voices—that singing should cease altogether during mutation—should not be thrust aside on account of some rare exceptions, and young singers be handed over to the "doubtful caprice of ignorant or careless teachers." A person might with "due care" and "strict supervision" live in a plague-stricken city without contracting the disease, but one would

not recommend his going there for his health. Why deliberately expose the voice to danger of loss or permanent impairment by advising that it can be used with safety during the period of transition? Far better to be on the safe side, wait until manhood or womanhood is definitely established, and then begin lessons as soon as possible.

CHAPTER III

ON BREATHING. INSPIRATION

We speak of the breath of life; and breath is the life of song. Beautiful singing is predicated upon correct methods of breathing, without which, though there be a perfect larynx and perfectly formed resonance chambers above, the result will be unsatisfactory. Breathing, in fact, is the foundation of the art of singing.

Breathing consists of taking air into the lungs and expelling it again, or as the physiologist would say, respiration consists of inspiration and expiration. Although they are essentially different actions, the laws governing each frequently have been confused by teachers of voice-culture.

There are books in which the singer is told to breathe naturally, and this direction is harped on and extolled for its simplicity. Surely no rule could be more simple; and, so far as simplicity goes, it is admirable. So far also as it casts doubt upon various breathing-methods which teachers of singing put forth as their own individual and pet devices, without which, they claim, aspirants for

the concert and operatic stage would be hopelessly lost, this direction serves a useful purpose. The trouble with it is, however, that it is too simple. It does not go far enough. It leaves too much to the individual. For obviously there will be, if not as many, certainly nearly as many opinions among as many different people as to what constitutes natural breathing; and a person may have become so habituated to a faulty method of breathing that he believes it natural, although it is not.

Correct breathing, although a function of the body, also is an art. The method of a singer to be correct should be based on artistic, not merely on natural, breathing. For while all artistic breathing is natural, it does not follow that all natural breathing is artistic. Therefore, the first direction to a singer should be, breathe artistically, with some definition of what constitutes artistic breathing.

Could the singer be relied on to breathe as naturally and unconsciously as in normal slumber, when the body is in a state of calm, nearly everything that has been written on the art of singing could be dispensed with. That, practically, is what the direction to breathe naturally amounts to. For such breathing is both natural and artistic. Un-

fortunately, however, a singer is not a somnambulist, and when he faces his teacher, or a large audience, he not only is not in that deliciously unconscious state induced by normal slumber, but he is very much awake, with the added tension caused by nervousness and excitement. He is conscious, self-conscious in the artistic sense, unless he has been trained to appear otherwise. For, in the final analysis, that lack of self-consciousness, that ease and spontaneity which we associate with the highest art, is, save in the case of a few superlatively gifted individuals, the result of method and training. Therefore, the direction to breathe naturally is begging the question. It states a result, without explaining how it is to be acquired. Once acquired, method is merged into habit and habit into seeming instinct—that is to say, it becomes method, responding so spontaneously to the slightest suggestion of the will, that only the perfected result of it is apparent to the listener. Under such favorable conditions created by a correct method of instruction, the nervousness inseparable from a début, and in many singers never wholly overcome even after frequent public appearances, is disguised by an assumption of calm, into which the poise and aspect of a trained singer naturally fall. All this

is much facilitated by the fundamental acquisition of correct breathing.

This correct breathing, which is the artistic respiration of the accomplished singer, is based upon physiological laws which can be described, prescribed and practised. When Salvatore Marchesi, the husband of Mathilde Marchesi, and himself a famous singer, said that prepared or instructed mechanical effort to get more breath results in less, he said what is true only if the instruction is wrong. His dictum, if accepted unreservedly, would leave the door open to all kinds of "natural," haphazard and go-as-you-please methods of breathing, the "simplicity" of which consists in simply being incorrect. The physiology of breathing is an exact science, and the singer who is taught its laws and obeys them, will acquire in due time the habit of artistic respiration. It is that breathing that is as natural and unconscious as in normal slumber, so *natural* in fact that it has to be acquired through correct instruction, because most men and women are unnatural or have taken on habits that are unnatural.

Taking in the breath, the function of inspiration, results in a readjustment of certain organs which become disadjusted by the act of expiration

or outbreathing. In general it may be said that the singer should breathe with the least possible disadjustment, so that only the least possible readjustment will be needed and the effort of breathing be minimized. Nature herself is economical, and the singer should economize the resources of breath. To breathe easily and without a waste of energy is essential to the best art, and gives a feeling to the listener that the singer, whose work he has enjoyed, has even more in reserve than he has given out. That sense of reserve force is one of the greatest triumphs of art. It is largely the result of effortless breathing, in which it is not necessary or even desirable that the singer always should strive to fill the lungs to the utmost, since that induces an obvious effort which diminishes the listener's enjoyment. Moreover, effort goes against the economy of nature. By keeping this in mind and by the use of correct methods, the singer will be able, in time, to gauge the amount of breath he requires for the tone he is about to produce or the phrase he is about to deliver, and the natural demand of the lungs will become his guide.

It is essential to correct breathing that the organs of the tract through which the breath passes in and out should at least be known. They include

the mouth, nose, larynx, trachea (or windpipe), the bronchial tubes and the lungs. A narrow slit in the larynx, called the glottis, and where the vocal cords are located, leads into the windpipe, a pliable tube composed of a series of rings of gristly or cartilaginous substance. The bronchial tubes are tree-like branches of the windpipe, and extend to the lungs, which are extremely elastic and, upon being filled with air, become inflated and expand somewhat like a balloon. It is necessary that in taking in breath and expelling it, this natural apparatus should be under the singer's control and that no undue force should be exerted upon the whole or upon any part of it, since this would result in its physical impairment and a corresponding impairment in production and quality of voice. It cannot be emphasized too often that the scientific method of voice-production based on the study of the physiology of the vocal tract is not a fad; as is proved by the fact that every violation of physical law affecting the vocal tract results in injury to it and in the same proportion affects the efficiency of the voice.

Before considering various methods of breathing it should be said that, irrespective of these, air should, whenever it is possible to do so, be taken

into the lungs through the nostrils and not through the mouth. True, there are times in singing when breath has to be taken so rapidly that mouth-breathing is a necessity, as otherwise the inspiration would not be rapid enough. But to inspire through the nostrils, whenever feasible, is a law not alone for the singer, but a fundamental law of health. In the passage from the mouth to the lungs there is no provision for sifting the air, for freeing it from foreign matter, or for warming it if it is too cold; whereas the nostrils appear to have been designed for this very purpose. Their narrow and winding channels are covered with bristly hairs which filter or sift and arrest the dust and other impurities in the air; and in the channels of the nostrils and back of them the air is warmed or sufficiently tempered before it reaches the lungs. Moreover it can be felt that the lungs fill more readily when air is taken in through the nostrils than when inspiration takes place through the mouth. That breath should be taken in through the nostrils is, like all rules in the correct physiology of voice-production, deduced from incontrovertible physical facts. It is, moreover, preventive of many affections of the lungs, bronchial tubes and throat.

Three methods of breathing usually are recognized in books on singing—but there should be only one. For only one method is correct and that really is a combination of the three. These three are called, respectively, clavicular, abdominal or diaphragmatic, and costal; clavicular, because it employs a forced movement of the clavicle or collar-bone accompanied by a perceptible raising of the shoulder-blades; abdominal or diaphragmatic, because breathing by this method involves an effort of the diaphragm and of the abdominal muscles; and costal, which consists of an elastic expansion and gentle contraction of the ribs, the term "costal" signifying "pertaining to the ribs."

Let me say right here, subject to further explanation, that neither of these methods by itself is complete for voice-production and that the correct method of breathing consists of a combination of the three, with the costal, or rib-expansion method, predominating. For of the three methods mentioned the expansion of the ribs creates the largest chest-cavity, within which the lungs will have room to become inflated, so that more air can be drawn into them by this method than by either of the others. But a still larger cavity can be created and a still greater intake of air into the lungs be

provided for, if, simultaneously as the ribs are expanded, the diaphragm, the large muscle separating the cavity of the chest from that of the abdomen, is allowed to descend and the clavicle is slightly raised, the final act in this correct method of breathing being a slight drawing in of the lower wall of the abdomen. Ignoring the slight raising of the clavicle, this method may be called the mixed costal and diaphragmatic, for it consists mainly in expanding the ribs and in allowing the dome-shaped top of the diaphragm to descend toward the abdomen. It calls into play all the muscles that control respiration and their coöperative nerves, provides the largest possible space for the expansion of the lungs, and is complete in its results, whereas each of the three methods of which it is a combination is only partial and therefore incomplete in result.

In the method of breathing called clavicular, the hoisting of the shoulder-blades is an upward perpendicular effort which is both ugly to look at and disagreeable in its results. For in art no effort, as such, should be perceptible. Moreover, as in all errors of method in voice-teaching, there is a precise physiological reason why clavicular breathing is incorrect. Correct breathing results, with

each intake of breath, in as great an enlargement of the chest-cavity as is necessary to make room for the expansion of the lungs when inflated. But as clavicular breathing acts only on the upper ribs, it causes only the upper part of the chest to expand, and so actually circumscribes the space within which and the extent to which the lungs can be inflated. It is an effort to expand the chest that is only partially successful, therefore only partially effective.

In fact, clavicular, or high breathing, requires a great effort to supply only a small amount of air; and this not only necessitates a frequent repetition of an unsightly effort, but, in consequence, weakens the singer's control over his voice-mechanism, makes inspiration through the nostrils awkward and, when the air has to be renewed quickly, even impossible, obliging the singer to breathe in violently, pantingly, and with other disagreeable and distressing symptoms of effort, through the mouth. The correct method of breathing involves only what may be called the breathing-muscles, but it utilizes all of these, thus insuring complete and effectual action; whereas clavicular breathing secures only a partial coöperation of these muscles, and in the effort involved in raising the clavicle and shoulder-blades actually is obliged to call on

muscles that simply are employed to lift the weight of the body, have nothing whatever to do with breathing and, from their position, are a hindrance rather than an aid to chest-expansion.

A better name for the method of breathing that is called "abdominal" would be abominable. It is predicated upon an exaggerated idea of the force of the action required of the diaphragm, or mid-riff, the large dome-shaped muscle which separates the thoracic from the abdominal cavity, in other words, the cavity of the chest from the cavity of the stomach. It is true that some animals can get all the breath they require to maintain life by the action of the diaphragm alone, yet it is a mistake to predicate breathing, and especially inspiration, upon a more or less violent action of the diaphragm and the abdominal muscles. Both diaphragm and the abdominal muscles are, indeed, used in breathing, but not to the forcible extent that would justify applying the term "diaphragmatic" or "abdominal" to the correct method of respiration.

The abdominal style of breathing was advocated by the physiologist Mandl, and it is said that soon afterward in the schools of singing which followed his theory most unusual devices were

practised for the purpose of keeping the ribs in a fixed position and compelling the pupil to breathe by the action of the diaphragm and abdominal muscles only. Thus, the pupil was compelled to sing while lying down on a mattress, sometimes with weights placed on his chest. In fact, masters are said even to have made a practice of seating themselves upon the chests of their pupils. Gallows, with thongs and rings for binding the upper half of the body and keeping it rigid, corsets and a pillory, which enclosed the frame and held the ribs in a fixed position, were some of the apparatus used in teaching the art of singing based upon abdominal breathing.

I have characterized clavicular breathing as an upward perpendicular force, ugly and only partially effective. Abdominal or diaphragmatic breathing is a downward perpendicular force just as ugly and as ineffective, besides being positively harmful, the pressure of the diaphragm, if violently exerted, often being injurious to the organs of the body contained in the abdominal cavity and especially to the female organs of sex. Yet unfortunately and only too often, this style of breathing is taught to women, because women, owing to corsets and tight lacing, incline to

breathe too much with the upper chest (to employ clavicular or high breathing), which, however, does not justify teachers in going to the other extreme and, in order to overcome one faulty method, instructing their pupils in another that is faultier still and even physically harmful.

A more nearly correct method of breathing is the costal—that is by expansion and contraction of the ribs. It enlarges the chest cavity more than does either the clavicular or the diaphragmatic method; but does not enlarge it to its full capacity. Each method by itself alone, therefore, falls short of the complete result desired. With none of them are the lungs wholly filled with air, but only partly—the upper part and a portion of the central lungs in clavicular breathing, the lower part and a portion of the central lungs in diaphragmatic breathing, and the central and upper parts in costal breathing. The correct method combines the three—adds to the inflation of the central and upper parts of the lungs accomplished by costal breathing, the inflation of the lower part accomplished in diaphragmatic breathing and of the extreme upper part accomplished in clavicular breathing. In other words, the correct method in-

flates the whole of the lungs and creates a cavity large enough to accommodate them.

It is mixed costal and diaphragmatic accompanied by a slight raising of the clavicle. As the air is taken into the lungs and the framework of the ribs expands, the dome of the diaphragm, naturally, and as if voluntarily, descends and, at first, the walls of the abdomen extend or are pushed outward. The clavicle is slightly, one might say passively, raised and, finally, the lower part of the anterior abdominal wall is slightly drawn in, thus forming a support or foundation for the lungs and at the same time putting the abdominal muscles in position for participation in the work of expelling breath.

This is the most natural and, from the standpoint of physiology, the most effective method of inspiration. For it creates the largest possible cavity in which the lungs can expand. The description of it may sound complicated, but the act of inspiration itself is not. If attention is concentrated upon expanding the entire framework of the ribs the rest seems to follow in natural sequence. As the framework of the chest expands, the movement of the ribs is outward and at the same time sidewise and upwards. This expan-

sion of the chest naturally enlarges the cavity behind it, and the lungs themselves find more space in which to expand. This triple movement of the ribs, especially in the combined outward and upward direction, the latter at right angles to the spine, causes a great enlargement of the chest-cavity and gives the lungs a great amount of space in which to expand. Combined with the sinking of the diaphragm, which still further adds to the space, and a slight raising of the clavicle which assists the expansion of the upper portion of the lungs, it constitutes the correct method of breathing. It is mixed costal and diaphragmatic—effected by the ribs, with the *assistance* of the diaphragm and the abdominal muscles, but very different from the method of breathing predicated upon so violent an effort of diaphragm and abdomen that it is called "diaphragmatic" or "abdominal" breathing, and very different also from pure "costal" breathing.

Patrons of opera and concert will have noticed that many great singers, when emitting the voice, incline the body slightly forward toward the audience, as if feeling more assured that their voices would carry to the listeners, or as if striving to get upon a more intimate footing with them. This

forward poise of the body, however, is a natural and physiological aid to a correct method of singing. I have stated that the upward and outward movement of the ribs greatly enlarges the chest-cavity, and with this slight forward poise of the body it is not necessary for the ribs to move all the way upward to the natural horizontal position in order to stand at right angles to the spine. In other words, the forward poise of the body eliminates a portion of the movement involved in inspiration, the spine now taking part and doing its share. This can readily be tested by holding the back straight or rigidly upright and taking a full breath by lifting the chest. The physical effort will be found much greater than when the body is slightly poised forward, and if the singer will gradually assume that poise and again fill his lungs with air, he will find that to do so requires less time and less strain. The forward poise of the body also favors many of the muscles employed in inspiration, because many of these extend upward and forward so that the forward inclination aids them in assisting the horizontal lifting of the ribs and the resultant enlargement of the chest-cavity. This assistance is greatly needed, for the singer sometimes is required within

the brief space of a quarter of a second to expand the framework of the ribs sufficiently to take into the lungs from 100 to 150 cubic inches more of air than they previously held.

This forward poise of the body is another illustration of the sound logic that lies in the application of physical laws to voice-production. For the forward poise which singers find so advantageous and which aids in the horizontal lifting of the ribs, also induces that gentle sinking in of the lower abdominal wall which is the final detail in the correct method of drawing in the breath and on which the old Italian masters of bel canto insisted as an important factor in their methods.

In considering the diaphragm and its part in costal or rib-breathing, care should be taken to make clear why it is that, while this muscle is a valuable aid to inspiration, its value would be impaired were it whipped into action like a conscript instead of being drafted, so to speak, as a volunteer.

In breathing a singer is required to take in, on an average, from 100 to 150 cubic inches of air, and one of the purposes of artistic breathing is to provide room in the chest-cavity for the expansion of the lungs due to this intake. The natural,

voluntary, and, I am tempted to say, *logical* descent of the dome of the diaphragm in artistic breathing allows for 25 cubic inches of the number required, and by no effort can it be forced down further to allow for more; or, to put the matter more correctly, the gain will be too insignificant to make the effort worth while. The gain of 25 cubic inches, although, of course, highly important, seems slight when the size and shape of the diaphragm are considered. It would appear as if the descent of the dome would allow for a much greater displacement. But the discrepancy is accounted for by the fact that about two inches above its lower border the diaphragm is attached to the ribs so that only a partial displacement is possible, which shows the futility of the more or less violent effort involved in pure diaphragmatic or abdominal breathing. Moreover, the hollow vein (vena cava) which leads the blood back to the heart, passes through the diaphragm, or, to be more exact, through its central tendon, and any violent action of the diaphragm in taking in breath tends to stretch this vein and, after a while, to create dizziness.

I should be sorry if what I have said regarding the diaphragm were to be construed as belittling

its importance as an aid to artistic breathing. My comments are directed against the exaggerated importance attached to it by advocates of wholly diaphragmatic or abdominal breathing, when it is capable of physiological demonstration that violent effort will accomplish no more with the diaphragm than that accommodating muscle accomplishes of its own accord when the singer, in taking in breath, correctly applies the principles of mixed costal and diaphragmatic respiration. In women only one-fifth and in men only one-sixth of the cavity needed for the inflation of the lungs can be made by sinking the diaphragm, the remaining four-fifths and five-sixths being created by the expansion of the ribs. Therefore, the diaphragm would be obliged to move five or six times as far downward as the ribs move upward, in order to make room for the same amount of air. In other words, the ribs need only make about one-fifth or one-sixth as much effort as the diaphragm, and effort—conscious, noticeable effort—is one of the first things to be avoided in any art and especially in the art of singing. "If a full, pan-costal inspiration be taken after a complete expiration," writes Dr. Harry Campbell in his "Respiratory Exercises in the Treatment of Disease," "no more

air, or at all events only a small quantity, can be inhaled by means of the diaphragm." This, however, should be construed as meaning that, after the diaphragm has performed its correct function in inspiration, any further violent effort on its part is practically futile. For the term "full, pan-costal inspiration," substitute "mixed costal and diaphragmatic," which will imply that the diaphragm has done its duty by the singer—and it is that apparently effortless performance of its duty that gives it its real importance. The diaphragm really is a most courteous and accommodating muscle when its assistance is politely invited, but most obstreperous when one tries to force it into action.

In proper breathing the feeling is as if the intake commenced with the upper ribs and terminated over the abdomen. We even feel, in taking in a deep breath, as if all our power were directed toward the four or five upper ribs and as if we were giving the greatest expansion to the very apex of the lungs; but the simple fact is that the six upper ribs encompass more space than the six lower ones, consequently in proper breathing the most movement is experienced where the cavity formed admits of the greatest expansion of the lungs.

To say that no other style of breathing excepting that which has been described as correct, the mixed costal and diaphragmatic, ever should be employed, would be a mistake, but any other should be employed, when at all, only for rare and specific effects. For example, a tenor in reaching for a high note may find that the violent raising of the collarbone and shoulder-blades, which is involved in clavicular breathing, assists him at the critical moment, and he may, rightfully, perhaps, employ that method in that one great effort of an evening—remembering, however, that Rubini actually broke his collarbone in delivering a very high note. Tenors sometimes reach for their high notes with their arms and legs, and if the high note comes out all right, we forget the effort in the thrill over the result, provided effort does not degenerate into contortion. Similarly in an unusually powerful, explosive *fortissimo,* a momentary use of pure abdominal breathing may be excusable. But these are exceptions that prove the rule, and very rare exceptions they should remain.

In breathing, the correct method of inspiration is to provide the room required for the inflation of the lungs by enlarging the chest-cavity to its greatest possible extent, which is accomplished by

expanding the whole framework of the ribs and allowing the diaphragm to descend, the clavicle rising passively while the wall of the abdomen at first extends and then, as to its lower anterior portion, slightly sinks in.

Sir Morell Mackenzie recognized that artistic inspiration is a combination of methods. "When costal or diaphragmatic breathing is spoken of," he writes in "Hygiene of the Vocal Organs," "it must always be remembered that in the normal human body both methods are always used together, the one assisting and completing the other. The terms are in reality relative, and are, or should be, applied only as one or the other type predominates in an individual at a given time." The only trouble about applying these terms singly to genuinely artistic breathing is that, in the nomenclature of respiration, they signify methods that are only partial, whereas correct inspiration is mixed costal and diaphragmatic, with a touch of the clavicular added. Such, then, is that "natural" method which also is artistic. It is based on sound physiological laws; and because these laws are, in turn, founded on fact, it is as efficient in practice as it is correct in theory.

CHAPTER IV

ON BREATHING. EXPIRATION

Air having been taken into the lungs, the act of exhaling it—the act of expiration—is, for ordinary purposes, a very simple matter. The elasticity of the parts of the body, the expansion of which made room for the inflation of the lungs, as these became filled with the air that was being drawn into them, permits the disadjustment to be readjusted almost automatically. Elasticity implies that a body which has been expanded returns spontaneously to its normal size and position. Thus with expiration the lungs return to their position of rest and the diaphragm and the walls of the abdomen follow them. This voluntary readjustment suffices for ordinary expiration. But the expiration of a singer should not be ordinary. It should be artistic. To begin with, while, whenever possible, air should be taken into the lungs through the nostrils, in singing it should always be expelled through the mouth. If part of the air-column is allowed to go out through the nose, there is danger of a nasal quality of tone-production.

In ordinary breathing the emission of air immediately follows the intake; expiration begins the moment inspiration ceases, and the respiration is completed. The elasticity of the lungs causes the diaphragm to rise and the walls of the chest to return to their natural position. Thus, in ordinary breathing, relaxation immediately follows the expansion, and almost as soon as the air is inhaled, it is expelled again.

But as breath is the foundation of song, it is something not to be wasted, but to be husbanded to the utmost. For of what value to the singer is a correct method of taking in breath if all or part of the air passes out before the tone is produced? It is an income dissipated, a fortune squandered.

The first step toward that breath-economy so essential in singing is to retain the breath a little while, to pause between inspiration and expiration. "Pause and reflect," one might say. For that pause, physiologically so helpful, as will be shown, appears psychologically to warn the singer against wasting breath and so to manage it that breath and tone issue forth simultaneously, the tone borne along on a full current of air that carries it to the remotest part of hall or theatre.

The pause before exhaling will be found by the

singer a great aid in enabling him to maintain control of the outgoing column of air and to utilize it as he sees fit without wasting any portion of it. Wilful waste makes woeful want in singing as in life.

How long should the breath be retained before emission? There can be no hard and fast rule. It is a matter of circumstance entirely, and it certainly is detrimental to postpone the next inspiration to the last moment before the next note has to be intoned or the next phrase started. Every opportune rest should be utilized for inspiration, and, if possible, the breath should be inhaled a second or two before the note or phrase to be sung, and the breath retained until the crucial moment. Then breath and song together should float out in a steady stream. The result will be pure, full, resonant tone. A *pianissimo* upon a full breath is like the *pianissimo* of a hundred violins, which is a hundred times finer than that of a single instrument, and so rich in quality that it carries much further. It is the stage-whisper of music.

This pause and the steadiness produced by it probably constitute what the old Italian masters of singing had in mind when they laid down for their pupils the rule "filar il tuono" or "spin the

tone," in other words, the practice of emitting the breath just sufficiently to produce a whisper and then convert it into a delicate and exquisite tone—a mere filament of music. Even in rapid passages which succeed each other at very brief intervals and such as frequently occur in the Italian arias, it is possible to replenish the breath in such a way that some pause, however brief, can be made between inspiration and expiration. Watch Melba singing the Mad Scene from *Lucia,* Tetrazzini, the Shadow Song from *Dinorah,* or Sembrich, the music of the Queen of the Night in the *Magic Flute,* and you will observe that they replenish the original intake of breath with half-breaths, a practice which enables them at every opportunity to make the required pause before breath-emission. Moreover, it always allows of a reserve quantity of air being retained in the lungs. That sense of unwasted resource, the feeling so important to convey to the audience that, much as the singer has accomplished, the limit of his capacity has by no means been reached, and that, like a great commander, he has his forces well in hand, is holding back his reserves and does not expect to launch them into action at all, can be created only by perfect control of the air-column; and that control of breath is

gained best by a pause, if only for a fraction of a second, between inspiration and expiration.

Moreover, holding the breath for a little while before expiration is conducive to good health, a condition, needless to say, which creates confidence and buoyancy in the singer and adds greatly to the efficiency of his voice and the effectiveness of his performance. Proper breathing is a cleaning process for the interior of the body. It cleanses the residual air, the air that remains in the lungs after each respiration; and it does much more. Air enters the lungs as oxygen; it comes out as carbonic acid, an impure gas created by the impurities of the body. The process of breathing dispatches the blood on a cleansing process through the whole body, and, while traveling through this, it collects all the poisonous gases and carries them back to the lungs to be emitted with expiration. By holding the breath we prolong this process, make it more thorough, and correspondingly free the body of more impurities. From the classic ages down physicians have advocated retaining the breath for a little while after inspiration as an aid to general health, and the taking and holding of a full breath has been compared with opening doors and windows of a house for ventilation.

Sir Morell Mackenzie emphasizes this purifying function of respiration in his book on the "Hygiene of the Vocal Organs." It consists, as he says, essentially in an exchange of gases between the blood and the air, wherein the former yields up some of the waste matters of the system in the form of carbonic acid, receiving in return a fresh supply of oxygen. It is evident from this how important it is to have a sufficient supply of pure air, air which contains its due proportion of oxygen to renovate the blood. A room in which a number of people are sitting soon becomes close if the windows and doors are kept shut. This indicates that the oxygen in the air is exhausted, its place being taken by carbonic acid exhaled from the lungs of the assembly, so that the purification of the blood must necessarily become more and more imperfect.

"Besides their principal function of purifying the blood," writes Sir Morell Mackenzie, "the lungs are the bellows of the vocal instrument. They propel a current of air up the windpipe to the narrow chink of the larynx, which throws the membranous edges or lips (vocal cords) of that organ into vibration, and thereby produces sound. Through this small chink, the air escaping from

the lungs is forced out gradually in a thin stream, which is compressed, so to speak, between the edges of the cords that form the opening, technically called the glottis, through which it passes. The arrangement is typical of the economical workmanship of nature. The widest possible entrance is prepared for the air which is taken into the lungs, as the freest ventilation of their whole mucous surface is necessary. When the air has been fully utilized for that purpose it is, if need be, put to a new use on its way out for the production of voice, and in that case it is carefully husbanded and allowed to escape in severely regulated measure, every particle of it being made to render its exact equivalent in force to work the vocal mill-wheel." Thus again is illustrated the close analogy between vocal art and physical law, and further evidence given of the value of a physiological method of voice-production as opposed to those methods that are purely empirical. In fact when it is considered that speech is Nature's method of communication and that song is speech vitalized by musical tone, it would seem as if song were Nature's art and, therefore, more than any other based on Nature's laws.

No effort is involved in holding the breath. The

pause before emission is accomplished without any internal muscular struggle, and without any constriction of the larynx. Some writers lay down the rule that after inhaling, the singer should retain the breath by closing the vocal cords. The only objection to laying down this rule is that it is apt to make the pupil perform consciously an act that is so nearly voluntary as to be unconscious. It inclines the pupil to make an effort when effort is unnecessary. Retain the breath and you can feel the vocal cords close in consequence, and as if of their own accord, and open again with the act of emission. It is all voluntary, or nearly so. In fact, artistic breathing becomes after a while a fixed habit and is performed unconsciously. In the early days of practice the pupil may be apt consciously to perform each of the successive acts comprised in artistic breathing. Gradually, however, messages begin to travel so swiftly over the nerves which connect the will, mind, or artistic sense with the breathing-muscles that these seem to have become sensitive by anticipation to what is required of them and voluntarily to bring themselves into play. The most subtle filament ever spun still is less fine than the line which divides the physiology of voice-production from the psychology of song and, by cross-

ing which, song, the art of Nature, becomes second nature.

The singer having after inspiration retained the air in his lungs for a brief space of time, also must maintain control of the stream of air when he begins to emit it. It should rise from the lungs through the bronchial tubes, the windpipe and the larynx into the mouth and flow out from between the lips like a river between smooth and even banks and bearing voice upon its current—a stream of melody. The more slowly, within reason, the singer allows his breath to flow out, the better; and this is as true of rapid phrases as of broad *cantabile*. Breath should be emitted as slowly in a long, rapid phrase as in a slow phrase of the same length. It is only when rapid phrases succeed each other so quickly that there is no time between them for a deliberate, full inspiration, that half-breaths have to be taken to replenish the air-supply. But a singer who thinks that rapid singing also involves rapid breathing should rid himself of that mistaken notion as quickly as possible. A choirmaster once told me that he had trained his boys so perfectly in breath-control that they could sustain a note for thirty seconds on one breath. For them to sing on one breath a rapid phrase lasting just as long,

would be equally feasible. It is the slow emission of breath that gives to long, rapid phrases a smooth and limpid quality; and it is the taking of breath at inopportune moments, as badly taught singers are obliged to do, that makes such phrases choppy and ineffectual. This fault is never observable in artists trained in the real traditional Italian school of singing—not necessarily by Italians, but in the traditional school of the old Italian masters.

The choppy method of singing is noticeable, not in all, but in many German singers. It is due to incomplete breath-control, for which in turn carelessness in matters of hygiene largely is responsible. The average German is of a naturally strong physique, and for this very reason he is less apt to take care of himself. The singer, in order to keep the keen, artistic edge on his voice, has to sacrifice many things that contribute to the comfort of the average man; and this is especially true of diet. A strict régime is a necessity. You will find that every great singer has to deny himself many things. But the German is apt to sneer at such precaution and to glory in what he calls "living naturally," which means that he thinks it is all right to eat and drink what he wants to and as much as he wants to. In point of fact, however, the great

singer does not "live" at all. He *exists* for his voice, sacrificing everything to it. His diet, his hours, are carefully regulated. He is always in training. The German is apt to neglect such matters. The inevitable result is shortness of breath and lack of control of breath-emission. Voice is breath; lack of breath is lack of voice.

I once attended a German performance of *Die Walküre* with an Italian master of *bel canto*. "You call that a love-scene!" he exclaimed during the latter part of the first act, between Siegmund and Sieglinde. "They are barking at each other like two dogs!" And so they were.

The natural process of expiration is one of complete relaxation. Just as the intake of air into the lungs inflates and expands them, so, when the intake ceases, the elasticity of the lungs exerts a natural pressure on the air they have taken in and causes its almost effortless exit. This exit, however, is so gentle as to be useless for the production of voice. For this reason the singer must control the breath and retard its exit, and the slower his expiration, the more control he will gain over the tone or phrase. Those familiar with the performances of some of the great opera singers who have been heard here will have observed that,

when singing, they do not allow the chest to collapse, but hold it as full and as firm as if the lungs still were inflated. This physical index to a correct method of expiration is more easily noticed in men than in women. The De Reszkes, Caruso, Plançon—these have been some of the most notable exponents of correct voice-production who have appeared on the American operatic stage. Let the reader, when next he hears Caruso or Plançon, note that they never strain after an effect, never labor, never grow red in the face, never employ excessive gesture to help force out a note. With them respiration consists of inspiration and expiration—never of perspiration. There is little danger that Caruso ever will break his collar bone in producing high C, and his delivery of the romance, "Una furtiva lagrima," in *L'Elisir d'Amore,* is a most exquisite example of breath-control and of voice-management in *cantabile;* while Plançon's singing from a chest absolutely immobile, even in long and difficult phrases, is so effortless that his performances are a delight to every lover of the art of song, his voice flowing out in a broad, smooth stream of music. Physically, the reason why an expanded chest retards the emptying of the lungs is apparent. The pressure

of a relaxing chest would accelerate their return to a condition of repose and the breath would be expended too soon, with the result that some or much of it would be wasted. Moreover, an expanded chest is a splendid resonance-chamber, affords a firm support to the windpipe and adds to the sure and vibrant quality of the tone produced. The wobble, which at times causes disappointment with voices that had seemed unusually fine, is the result of lack of attention to this detail of vocal method. The windpipe, requiring the support of a firm chest-wall, becomes unsteady, the singer loses his control of the air-column, and the vibrations of the vocal ligaments are uncertain, instead of tense and sure.

To maintain the expanded chest during expiration, which also means during singing, is not difficult. There is nothing forced about it. For if there is the correct pause after inspiration, if the breath is held for a brief space of time, the pressure naturally exerted outward upon the upper chest is readily felt. Accompanying it is a gradual drawing in of the lower abdominal wall, not forceful enough to be called stringent but simply following the return of the diaphragm to its natural position as the lungs return to theirs. Therefore, when it

is stated that if a *crescendo* is to be produced on a single tone or phrase, this is accomplished by increasing the outward pressure on the chest and the inward and upward pressure of the abdominal muscles; there is no thought of prescribing a sudden and undue strain, but simply of employing more potently and more effectively certain forces of pressure which Nature herself already has brought into play. What is perhaps the most important distinction of this method of breath-control and voice-management is the fact that it relieves the throat of all pressure, the correct tension and vibration of the vocal cords being brought about by the reflex action of muscles and nerves. This lack of strain on the throat does away with all danger of a throaty quality of voice-production, which not only is highly inartistic but also leads to various throat troubles.

Breath-control implies that no breath is wasted, that every particle of breath, as it comes out, is converted into voice. Dissipation of breath results in uncertainty of voice-production, a branch of the subject which will be taken up in the chapter on "attack." An excellent test for economy of breath is to hold a lighted candle before the mouth while singing. If the flame flickers, breath is being

wasted, is coming out as empty air instead of as voice. There is the same difference between voice produced on breath that is under the singer's control and that produced on breath which is not properly steadied, as there is between a line drawn straight and sure by a firm hand and a wavering line drawn by a hand that is nervous and trembling. In fact, in singing the waver of the voice that results from poor control of breath is a tremble, a *tremolo,* and is one of the worst faults in a singer.

It also should be pointed out that the singer is not to continue an expiration beyond the point when it ceases to be easy for him to do so. As soon as the air-column becomes thin the singer's control over it becomes insecure, and, from that point on, the air that remains should be regarded simply as a reserve supply and aid to the next inspiration.

To sum up: Breathing consists of two separate actions, inspiration and expiration, the intake of air and its emission. Of the three kinds of inspiration mentioned in most books on singing and termed clavicular, abdominal or diaphragmatic, and costal, neither completely fills the bill. The correct method of inspiration is a combination of all three. It is costal—that is indicated by an

expansion of the whole framework of the ribs—assisted by an almost automatic sinking of the diaphragm and a very slight, almost passive, rising of the clavicle, the final detail being a slight sinking in of the lower front wall of the abdomen. In this method, although it is a combination of the three—the clavicular, the diaphragmatic and the costal—the clavicle plays so small a part, that the method may be termed mixed costal and diaphragmatic.

The breath having been taken in, it should be held for a brief space of time.

In expiration, allow the breath to escape very slowly. Maintain the chest firm and expanded, and add, as occasion requires, to the natural inward and upward pressure of the abdominal muscles. Avoid all throat effect. After expiration the chest and abdominal pressure is relaxed and the next inspiration prepared for.

Take in breath through the nostrils, emit it through the mouth. This latter instruction may seem superfluous, but it is not. In the so-called "backward production" of voice, considerable air escapes through the nasal passages and the tone-quality is nasal and disagreeable.

It is of the highest importance to acquire a cor-

rect method of breathing, and to acquire it so thoroughly that it becomes second nature. In the beginning it may be necessary to bear each successive step in mind and make sure that it is not omitted. But very soon artistic breathing to sustain song becomes as much a habit as is breathing to sustain life. We breathe, or we cannot live; we breathe artistically, or we cannot sing. But to breathe artistically really is no great problem. It is a simple matter, yet fraught with great and invaluable results to the singer; and it is a simple matter because it becomes so easily a matter of habit. The nerves of the breathing-muscles send and receive messages to and from the nerve-centre, but after incredibly little practice this interchange of messages over the nervous system becomes so swift that it may be said to take place by anticipation, and the person who benefits by it is unaware that it takes place at all. Correct breathing has then become a habit. This habit, this smooth working, automatic coöperation of nerves with breathing-muscles, may be thrown out of gear by something unusual, such as the excitement attending a début.

The singer faces an audience or a strange audience for the first time, and the first unfavorable

and disconcertive effect travels over the nerves to the respiratory organs. Regular breathing is at such times one of the best ways to allay the undue excitement caused by the unusual surroundings. Before beginning to sing the artist should, and on such occasions with conscious artistry, immediately reëstablish control of respiration by taking a few deep breaths. I have said before that the borderline between the physiology of voice-production and the psychology of song is a narrow one—whereof the above cure for stage-fright is but another case in point.

CHAPTER V

THE PHYSIOLOGY AND PSYCHOLOGY OF VOICE-PRODUCTION

ABOVE this chapter I might well have placed the following lines which George Eliot wrote above Chapter XXXI. of "Middlemarch."

> How will you know the pitch of that great bell,
> Too large for you to stir? Let but a flute
> Play 'neath the fine-mixed metal! Listen close
> Till the right note flows forth, a silvery rill:
> Then shall the huge bell tremble—then the mass
> With myriad waves concurrent shall respond
> In low, soft unison.

The lines telling of the great bell stirred by the note of a flute played at the proper pitch suggest the moving power that lies in sympathetic vibration. The first time a military body crossed the Brooklyn Bridge, the spectators were surprised to hear the order given for the soldiers to march out of step. They had expected to be thrilled by the sight of a thousand men crossing the great structure in measured tread, with band playing and colors flying. They did not know that the structure, being a suspension bridge, might have been

weakened and possibly destroyed by the force of rhythmic oscillation. Yet the accumulated force in the tramp of a thousand men is no greater than that which lies in the sympathetic vibrations of a musical note. Every metal structure has its note, and it is an old engineering saw that a huge structure like the Brooklyn Bridge eventually could be destroyed by the cumulative force of sympathetic vibration evoked by a musical instrument constantly reiterating the note of the bridge.

Sound has three dimensions: pitch, loudness and timbre.

Pitch depends upon the *frequency* of vibrations. The more rapid the vibrations, the higher the pitch.

Loudness is determined by the *amplitude* of the vibrations. As their length or "excursion" increases, so does the sound gain in loudness. Conversely, the diminution in the size of vibrations causes corresponding decrease of loudness.

Differences in the *shapes* of vibrations cause differences in quality or *timbre.*

After voice has originated within the restricted limits of the larynx, its power, its carrying quality is much augmented by the sympathetic vibrations within the resonance cavities above the larynx. These include the pharynx, nasal passages, mouth,

bone cavities of the face—in fact pretty much every hollow space in the head, every space that will resound in response to vibration and assist in multiplying it. Moreover, the cavities of resonance by their differences in shape in different individuals determine the timbre or quality of individual voices. The chest, although situated below the larynx, is a resonance cavity of voice. In fact, in a certain register its vibration is felt so distinctly that we speak of these notes as being sung in the "chest register," which, so far as it implies that the tones are produced in the chest, is a misnomer. The same is true of "head register," in which vibration is felt in the head where, however, it is needless to say, the "head tones" do not originate.

Expiration—breath-emission—is the motor function of the vocal organs; and there are two other physical functions of the organs—vibratory and resonant.

Added to these is the sensory function, to which I attach great importance; and I call it a psychological function because it acts through the nerves upon the physical organs of voice. Without it the three physical functions—motor, vibratory and resonant combined—would remain ineffectual. They could generate voice, but it would be voice

lacking those higher qualities that are summed up in the word "artistic." It would be a physical, not an art product, a product generated by the body without the coöperation of the mind or soul. When it is considered that the larynx, in which the vocal cords are situated, is permeated by a network of muscles through which it is capable of some 16,000 adjustments and readjustments of shape, all of them pertinent to voice-production, and that the same thing also is true of the pliable portions of the resonance cavities; that these muscles act in response to an even finer network of nervous filament; and that the constant shaping and reshaping of various parts of the vocal tract during voice-emission is directed by messages from the mind, soul, or art-sense of the singer, messages which travel via nerve to muscle—the only route by which they can travel—it becomes possible to appreciate the importance of the sensory or psychological function which, I hold, should be added to the purely physical ones of motor, vibration and resonance. For by it these functions are enlisted in the service of art and made immediately and exquisitely responsive to the emotional exaltation of music and song. Nor are these vague terms. Psychology of song and psychological action in general may seem

indefinite and unintelligible. They become, however, absolutely definite and intelligible when the part played by the nerves as intermediaries between mind and muscular action of a subtle and highly refined order is appreciated. The mind presses the button, the nerves carry the messages, and muscle acts instantaneously and responsively.

The student need not despair because so many separate acts seem necessary to the production of even a single tone. It is true that air has to be taken into the lungs and emitted from them; that it must be controlled by the singer as it passes up the windpipe; that the vocal cords and other parts of the larynx must be given their specific adjustment for each note; and the cavities of resonance shaped in sympathetic coördination with those numerous adjustments, while the lips also have their function to perform. But it is equally true that correct instruction supplemented by assiduous practice merges all these separate acts into one. The singer thinks the note, forms what may be called a sounding vision of it in his mind, and straightway the vocal tract adapts and coördinates all its parts to the artistic emission of that note. It is auto-suggestion become habit through practice.

Because the larynx is so important a factor in generating voice, writers on voice-production have described it with much minuteness, and because of these minute descriptions readers may have obtained an exaggerated idea of the size of this organ. But one of the marvels of voice-production is the smallness of the organ in which voice is generated, the size of the average larynx being about two inches in height by an inch and a half in width. Yet so numerous are the adjustments in shape of which this small organ is capable that the phenomenal soprano, Mara, could make 100 changes in pitch between any two notes in her voice, and as this had a compass of twenty-one notes, it follows that she could produce no less than 21,000 changes in pitch within a range of twenty-one notes. While in Mara's day this no doubt was attributed to a natural gift of voice, modern study of voice-physiology and of the metaphysics of voice-production readily accounts for it. It needs an ear naturally or by training so delicately attuned to pitch that not only all the fundamental notes of a voice, but all the numerous overtones at infinitesimal intervals are heard in what may be called the singer's mental ear; that the nerves convey each of these sounding mental conceptions to

the intricate system of muscles in the larynx and resonant cavities and that the right muscles immediately adjust the larynx and cavities of resonance to the shape they have to assume to sound the corresponding note. Every vocal tone is, in fact, a mental concept reproduced as voice by the physical organs of voice-production, so that every vocal tone is, in its origin, a mental phenomenon. That is why an inaccurate ear for pitch results in a vocalist singing off pitch. His mental conception of the note is wrong, the message conveyed from the mind over the nerves to the muscles of the vocal organs is wrong, consequently they shape themselves for a note that is wrong, and, when the note issues from between the singer's lips, it is wrong—wrong from start to finish, from mind to lips. Thus again is illustrated the intimate connection between psychology and physiology in voice-production, and the necessity of having every function concerned therein so thoroughly trained that every act from mental concept to sounding voice is correctly performed through a habit so thoroughly acquired that it has become second nature. In common parlance one might say to the student of song, "Get the correct voice-habit and keep it up," for that really is what it amounts to, only it is neces-

sary that great stress should be laid on the word "correct."

It now becomes necessary to describe the larynx, and this I will endeavor to accomplish without puzzling the reader with too many technical terms. The study of the larynx was made possible by the invention of the laryngoscope in 1855 by Manuel Garcia, a celebrated singing-master. It is a simple apparatus—which, however, does not detract from but rather adds to its value as an invention—and has been a boon to the physician in locating and curing affections of the throat. Its essentials are a small mirror fixed at an obtuse angle to a slender handle. Introduced into the mouth it can be placed in such position that the larynx is reflected in the mirror and thus can be observed by the operator. Those who have had their throats examined with the laryngoscope will recall that the operator wears a reflector over his right eye. Through a central perforation in the reflector he views the image, which is seen the more clearly for the light thrown upon the laryngoscopal mirror by the reflector. It would be possible after comparatively little practice with the apparatus for a singer to examine his own larynx. But it would be most inadvisable for him to do so. Either he soon would become

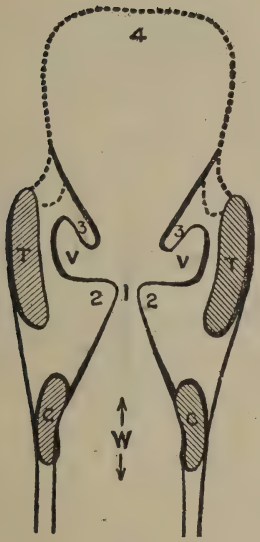


FIG. 5. VERTICAL TRANSVERSE SECTION OF THE LARYNX

1, The Glottis (*i. e.*, the opening between the opposed edges of the Vocal Cords). 2, True Vocal Cords. 3, False Vocal Cords 4, Epiglottis. (N. B.—In singing, the "true cords" are closely approximated.)

V, Ventricles. T, Thyroid Cartilage. C, Cricoid Cartilage.
W, Windpipe or Trachea.

(N. B.—In STRAINING, the "false cords" are closely approximated.)

Fig. 2. The Glottis and Vocal Cords Viewed from Below
N. B.—Vocal cords approximated

Fig. 3. The Glottis and Vocal Cords Viewed from Above
1, Glottis. 2, True Cords. 3, False Cords. 4, Epiglottis. 5, Base of Tongue.
N. B.—Glottis open for inspiration

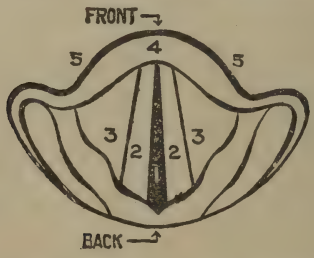


Fig. 4. The Glottis and Vocal Cords Viewed from Above
1 Glottis. 2, True Cords. 3, False Cords. 4, Epiglottis. 5, Base of Tongue.
N.B.—Vocal cords approximated

"hipped" on the subject of innumerable imaginary throat troubles, or his voice-production would become mechanical, which is very different from the spontaneous adjustment of the vocal tract described above.

The laryngoscope should not, in fact, leave the hands of the physician. Invaluable for the detection of diseases of the throat which impair the voice and which have to be cured either by treatment or operation before the voice can be restored to its original potency or charm, its value in studying the physiology of voice-production and the functions of the vocal organs is doubtful. In fact, it is its use by amateur larynogoscopists that has resulted in the promulgation of all kinds of absurd theories of voice-study and in those innumerable pet methods of vocal instruction, each one of which may safely be guaranteed to destroy expeditiously whatever of voice originally existed. Fascinating as it may seem to the singer to examine his own larynx while he is producing a vocal tone—"during phonation," the physiologist would say—the value of the deductions formed from such observation may be doubted, if for no other reason than that the introduction of the mirror into the back of the mouth makes the whole act of phonation

strained and the effects observed unnatural. In fact, as Mackenzie already has pointed out, although the laryngoscope is invaluable in the recognition and treatment of diseases which before only could be guessed at, "with the exception of certain points relating to the 'falsetto' register, it can scarcely be said to have thrown any new light on the mechanism of the voice." In other words, the instrument belongs in the hands of the physician, not in those of the singer.

The larynx, as I already have stated, is a small organ, on an average two inches long and one and a half inch wide. The reader can form a good idea of its location by the Adam's apple, which is its most forward projection at the top.

From the singer's point of view the larynx exists for the sake of the vocal cords—in order that they may be acted upon by certain muscles and thus relaxed or tightened, lengthened or shortened, or by a combination of these states properly adjusted to the note that is to be produced. The vocal cords lie parallel to each other. The space between them (the opening through which the air from the windpipe passes up into the larynx) is called the glottis. With every loosening, tightening, lengthening or shortening of the vocal cords

or other effect of muscular action upon them, the space between them—the glottis—alters in size and shape. These subtle changes in the size and shape of the glottis are, as I shall expect to show, of great importance in voice-production. They form the first step in the actual creation of voice.

The numerous and subtle adjustments and readjustments in shape of which the larynx is capable could not be effected if its shell consisted of so hard and unyielding a substance as bone. Consequently, it has to consist of a substance which, while sufficiently solid to form a background for the attachment of its numerous muscles, yet is sufficiently pliable to yield with a certain degree of elasticity to the action of these. Nature therefore has built up the larynx with cartilage, or gristle, providing a framework made up of a series of cartilages, sufficiently joined to form a firm shell surrounding the muscular tissue, yet, being hinged as well as joined, capable of independent as well as of combined movement, and, withal, possessing the requisite degree of pliability to respond in whole or part to the extremely varied and often delicate action of the laryngeal muscles—muscles which indeed are required to be as practised and as sensitive to suggestion as if they were nerves.

The principal cartilage of the larynx is the thyroid or shield cartilage, named from the Greek *thureos* (shield). It really consists of two shields joined along the edges in front (its most forward upper projection being the Adam's apple) and opening out at the back. The thyroid is the uppermost cartilage of the larynx and the Adam's apple is the uppermost portion of the front of the larynx. But as the shields open out back of the Adam's apple, they slope upward and at the extreme back each shield has a marked upward prolongation like a horn. By these horns, enforced by membrane, the thyroid cartilage and through it the whole larynx is attached to and is suspended from the hyoid bone, or tongue-bone. This gives mobility to the larynx and freedom of movement to the neck; and the larynx, while mobile as a whole, furthermore is capable of an infinite number of muscular adjustments and readjustments within itself.

At the back the lower edges of the thyroid rest upon the cricoid cartilage, which derives its name from the Greek *krikos,* a signet-ring. This is next in size to the thyroid. The broader portion, the part which corresponds to the seal in a signet-ring, is at the back. Attached at the back,

the two cartilages do not, however, meet in front. Place a finger on the Adam's apple, slide it down a little way, and the slight depression there met with locates the front opening, covered with yielding membrane, between the thyroid and cricoid cartilages.

On the broader part of the cricoid—that is, on the part in the back of the larynx—and rising inside the thyroid are two smaller cartilages, the arytenoid or ladle cartilages, named from the Greek *arutaina,* a ladle. Though smaller than either thyroid or cricoid, they are highly important, because they form points of attachment for the vocal cords. These (the vocal cords) are attached in front to the inner part of the angle formed by the two wings of the thyroid just back of the Adam's apple, and behind to a forward projecting spur at the base of each of the arytenoid cartilages, which for this reason often are spoken of as the "vocal process."

The vocal cords, as has been stated, lie parallel to each other, and the space between them is known as the glottis or chink of the glottis. Above the glottis and on opposite sides are two pockets or ventricles, and above these are the so-called false cords or ventricular bands. The pockets are, in

fact, bordered below by the vocal cords and above by the false cords. The false cords or ventricular bands (a name given to them by Mackenzie) are the lower edges of membranous folds that form the upper entrance to the larynx. Here are two pairs of small cartilages, the cartilages of Santorini and the cartilages of Wrisberg. Usually they are dismissed as of little or no importance. Yet they have, in connection with muscles located in that part of the larynx, their rôles to play in those numerous adjustments and readjustments which, as I shall show a little later on, are of the greatest importance in voice-generation. For I consider, as I also will show, that the numerous, indeed innumerable, and extremely subtle and exquisite changes of shape of which the larynx is capable within itself, have much to do with the actual creation of the tone which eventually issues from the lips; although I believe this statement to be contrary to all accepted authority. For the present, however, I must content myself with this mere statement.

The larynx is protected above by a lid, a flexible, leaf-shaped cartilage, the epiglottis. The gullet, or food-passage to the stomach, is situated behind the larynx and windpipe, and the function of the epiglottis is to close the larynx and to act as a

bridge over which food passes from the mouth into the gullet. But for the epiglottis, food might get into the larynx and thence into the windpipe every time we swallowed, with what distressing and even disastrous effect any one who has ever "swallowed the wrong way" well knows. When open, on the other hand, the epiglottis forms a beautifully smooth cartilaginous curve, over which the sounding air, the tone, as it issues from the larynx, is guided to the resonance cavities above the larynx, which are the cavities of the mouth and of the nose. While parts of these cavities are solid, like the roof of the mouth, other parts, like the soft palate, are pliable; while the tongue is so astoundingly mobile that it constantly can alter the resonance cavity of the mouth as to dimension and shape.

The larynx is swathed and lined with membrane and muscle. These membranes and muscles are named after the cartilages to which they are attached, between which they lie, or which they operate. There is no reason why they should be enumerated now. The function of the muscles of the larynx is stated by all authorities with which I am familiar to be twofold—to open and close the glottis (the space between the vocal cords),

and to regulate the tension of the vocal cords, because the vibrations of these are considered the determining factor of vocal pitch. Sir Morell Mackenzie, however, in describing the muscles of the larynx in a passage couched in untechnical language, unconsciously gives a hint of another purpose for which the complexity of muscles in the larynx may exist. After speaking of the "innumerable little fingers of the muscles which move the vocal cords," he continues: "These fingers (which prosaic anatomists call *fibres*), besides being almost countless in number, are arranged in so intricate a manner that every one who dissects them finds out something new, which, it is needless to say, is forthwith given to the world as an important discovery. It is probable that no amount of macerating or teasing ever will bring us to 'finality' in this matter; nor do I think it would profit us much as regards our knowledge of the physiology of the voice if the last fibrilla of tiny muscle were run to earth. The mind can form no clearer notions of the infinitely little than of the infinitely great, and the microscopic movements of these tiny strips of contractile tissue would be no more *real* to us than the figures which express the rapidity of light and the vast stretches of astronomical time and dis-

tance. Moreover, no two persons have their laryngeal muscles arranged in precisely the same manner—a circumstance which of itself goes a considerable way toward explaining the almost infinite variety of human voices. The wonderful diversity of expression in faces which structurally, as we may say, are almost identical, is due to minute differences in the arrangement of the little muscles which move the skin. The same thing holds good of the larynx."

These are significant words. The distinguished physician who wrote them might just as well have said that the generally prevailing theory that in voice-production the muscles of the larynx exist solely to open and close the glottis and to regulate the tension and hence the vibration of the vocal cords, is incorrect. For they also exist in order to shape and reshape the entire larynx within itself according to the note to be produced, and the opening or closing of the glottis with the degree of tension of the vocal cords resulting therefrom is but one detail in the coördination of adjustments and readjustments which prepare the vocal tract to produce the tone the singer hears in his mind. Nearly every authority on the physiology of voice-production believes that the vocal tone is produced

solely by the vibration of the vocal cords, and that the entire vocal tract situated above the vocal cords is concerned merely with augmenting the tone and determining its timbre or quality. Let us examine this theory and ascertain how tenable it is.

To begin with, the term "cord" as applied to the vocal cords is misleading. It suggests a resemblance between the vocal cords and the strings of a violin, which are capable of great tension, or at least a resemblance between the vocal cords and the vibrating reed of a reed-instrument. In point of fact, the vocal cords are neither strings nor reeds, and are not even freely suspended from end to end or from one end like reeds, but are attached along their entire lower portion to the inner wall of the larynx. Therefore they are not cords, nor strings, nor reeds in any sense whatsoever. They are shelves composed of flesh and muscle, their substance resembles neither the catgut of which the strings of stringed instruments are made nor the cane, wood or metal of which the reeds of reed-instruments are formed; and the entire length of each cord is a trifle more than half an inch in men and a little less than half an inch in women. Almost every writer on voice appears to consider the term "cord" as applied to them a misnomer.

They have been spoken of as membranous lips. "The vocal 'cord' is not a *string,* but the free edge of a projecting fold of membrane," says Mackenzie. Yet it is not only claimed but announced over and over again as a physiological fact that the human voice, sometimes sweet and mellow, sometimes tense and vibrant and with its great range, is produced solely by the vibration of two projecting folds of membrane, free only at their edges and at their longest only a little over half an inch in length.

At least one writer on voice-production, Prof. Wesley Mills, appears to have doubted the correctness of the old and oft-repeated theory. "Allusion must be made," he writes in "Voice-Production in Singing and Speaking," "to the danger of those engaged in mathematical and physical investigation applying their conclusions in too rigid a manner to the animal body. It was held until recently that the pitch of a vocal tone was determined solely by the number of vibrations of the vocal bands, as if they acted like the strings of a violin or the reed of a clarinet, while the resonance chambers were thought to simply take up these vibrations and determine nothing but the quality of tone . . . It seems probable that the vocal bands so beat the air within the resonance cham-

bers as to determine the rate of vibration of the air of these cavities, and so the pitch of the tone produced." This at least shows dissatisfaction with the old theory and attaches some share of their due importance to the resonance cavities, but it still is far from describing the correct phenomenon of voice-production.

Show a lateral section of a larynx to a trumpet or horn player and he will at once recognize its similarity to the cupped mouthpiece and tube of trumpet or horn, the cup in the larynx being formed by the ventricles or pockets above the vocal cords. Extend the picture so that it includes not only the larynx but the resonance cavities of the head as well, and the cornet, trumpet or horn player will recognize the similarity to the tube of his instrument as it turns upon itself. The manner in which the lips shape themselves as the player blows into the instrument, the form and size of the cup, the gyration and friction of the air within it and within the bent portion of the tube, determine the pitch and the quality of the tone that issues from the bell of the instrument.

The shape assumed by the lips, which are capable of many exquisite variations in shape, conditions the form of the air-column as it enters the

cup of the trumpet or horn. This I believe to be one important function performed for the larynx by the vocal cords, which Mackenzie, with an aptness he could not have appreciated, called the lips of the glottis. They are, in fact, the lips of the essential organ of voice, the larynx. If they are looked at from below they will be seen to be bevelled, and their resemblance to lips even more striking.

While, however, the importance of the vocal cords in tone-production has been overestimated, I should be going to the opposite extreme if I limited their importance to their function as the lips of the glottis. Not only are they lips, but vibrating lips, their vibrations, however, requiring enforcement through the sympathetic vibrations which they generate within the cup of the larynx and in the cavities above. As lips, the vocal cords shape the air-column as it enters the larynx, to the required note; as vibrating lips—set into vibration by the very air-column to which they have given shape—they start the vibrations essential to pitch and pass them along into the cup of the larynx, which also has shaped itself to the note and where gyration and friction begin to reinforce the vibrations started by the cords. What is true of the cup also is true of the resonance-cavities. In other

words, the entire vocal tract, from cords to lips, shapes and reshapes itself with reference to the tone that is to be produced, and what thus goes on above the vibrating cords coöperates to produce the effect formerly attributed to the cords alone.

The fact that the cup of the larynx subtly changes its shape for each tone produced, makes the hitherto obscure subject of registers of the voice, which many writers have written *around* but none *about,* perfectly clear. The cup assumes what may be called a generic shape for each register, and then goes through subtle adjustments of shape for the different notes within each register. But this is a subject to be taken up in detail later.

The reader now will understand why at different points in this chapter I have emphasized the fact that the larynx as a whole and throughout all its parts is capable of numerous adjustments in shape, and that the same is true of the resonance-cavities. The vocal tract of an accomplished singer is capable of as many adjustments as a sensitive face is of changes in expression. This phenomenon is the vocal tract making ready to generate, vitalize and emit the tone suggested by the mind—mind pressing the button, the physical organs of voice-production doing the rest.

CHAPTER VI

PITCH AND SYMPATHETIC VIBRATION

It is sympathetic vibration, manifesting itself in some instances in the chest and in the head cavities, and in other instances almost entirely within the latter, that gives to voices their peculiar timbre or tone-quality—their physiognomy. It is by timbre that we distinguish voices as we distinguish features. With instruments, differences in quality of tone—differences in timbre—are due to differences of shape; and in case of instruments of the same kind, for example, violins, to slight differences in form or to the grain, age and quality of the wood. In the same manner, there are minute differences in the structure of the vocal tract of different people; and it is especially the structural differences between the resonant cavities of individual singers that determine differences of timbre or quality. It is easy to distinguish between tones even of the same pitch that come from a harp, a violin, a trumpet, a flute or from the human voice. Between two violins of exactly the same make, played on by the same person, there would be greater difficulty

in discovering differences in the quality of tone, although, even if made after the same pattern and about the same date, there probably would be minute structural differences that would differentiate their timbre to a musical ear; while if, of two violins, one of the instruments were new, and the other old, a musical ear probably would immediately detect differences in their tone-quality.

It is easier to distinguish between voices even of the same range, than between instruments of the same kind, because there is strong individuality in voices. This is due to the fact that structural differences between the vocal tracts of individuals are far more numerous and far more minute than possibly can be introduced into instruments. Moreover, the vocal tract, being part of the human body, is subtly responsive to innumerable impulses and adjusts and readjusts itself in innumerable ways. Instruments are made of material, chiefly wood and metal, and, unlike the vocal tract, cannot change structurally. The cornet, for example, is made of brass. The lips of the player protruding into the cup can effect certain changes in shape, and changes also can be made in the tube between the mouthpiece and the bell of the instrument by pistons or valves. But these changes are absurdly small in

number compared with the structural changes of which the vocal tract is capable, and commonplace in character compared with the refined and subtle minuteness of the latter. For this reason, while there is a distinct timbre for each kind of instrument, there are innumerable timbres of the human voice—as many as there are voices, and all due to the pliability of the vocal tract.

It is the manner in which the numerous individual conformations of the vocal tract affect the overtones in the voice that makes voices different from each other; for the overtones are the chief agency in determining the timbre, quality, or physiognomy of any tone. Every tone consists of a fundamental or ground tone with its overtones. The fundamental tone determines the pitch; the overtones determine the quality, tone-color, timbre, or physiognomy of the tone.

The overtones, or harmonics, as they also are called, vibrate in certain simple harmonic relations with the fundamental—from twice to five times as often per second, sounding the octave above, the fifth of that octave, the second octave, the major third of that octave, etc. So important is it to the individual musical quality of tone, to secure the coöperation of overtones, that in certain large open

organ pipes, which are deficient in these, extra pipes of higher pitch and corresponding with the overtones of the fundamental note, are added and joined to the register. Overtones without the fundamental can be obtained on stringed instruments by stopping one of the strings and then touching it lightly at other points. The soft, sweet, ethereal character of the harmonics produced in this manner on a violin conveys some idea of the manner in which the many overtones of a note give it its distinctive quality.

In a way the overtones may be said to echo the fundamental, but the ear receives fundamental and overtones blended as one tone of a certain timbre. What that timbre is, is determined by the shape of the resonating cavity or cavities, the shape of which in turn is determined by the shape of the instrument, and in different voices by infinitesimal differences in the shape of various parts of the vocal tract. All instruments of a kind are made more or less on the same pattern and vary but little in shape. For this reason we have the distinct violin, horn, clarinet or pianoforte timbre, and so on down the list, but I repeat here that there are not such minute and individual differences between instruments of the same kind as there are

between voices of the same range, because there are no such minute and individual structural differences in instruments as in the vocal organs of individuals—differences that each individual can multiply *ad infinitum* by the subtle and delicate play of muscles acting in response to mental suggestion, art sense, inspiration, temperament, psychic impulse, or by whatever cognate term one may choose to call it.

There is little or nothing of psychology in Mackenzie's book, and yet, like other writers on voice-production, he appears now and then to be groping for it. Thus, when he speaks of the fundamental tone being reinforced by its overtones—by a number of secondary sounds higher in pitch and fainter in intensity—he adds very beautifully that every resonance-cavity has what may be called its elective affinity, or one particular note, to the vibrations of which it responds sympathetically like a lover's heart answering that of his beloved. "As the crude tone issues from the larynx, the mouth, tongue and soft palate, moulding themselves by the most delicately adaptive movements into every conceivable variety of shape, clothe the raw bones of sound with body and living richness of tone. Each of the various resonance-chambers reëchoes

its corresponding tone, so that a single well-delivered note is, in reality, a full choir of harmonious sounds."

Voice being, like instrumental tone, a commixture of fundamental and overtones, and the manner in which the composite conformation of collective waves strikes the ear being largely determined by the cavities of resonance, the control of these is of great importance to the singer. This control should, by thorough training, be brought to such a degree of efficiency that it becomes subconscious and automatic, so that the resonance-cavities shape themselves instantly to the note that is being produced within the larynx and, vibrating in sympathy with it, sound the overtones. The reciprocal principle of elective affinity between fundamental and overtone, between the shape assumed by the larynx for pitch and the shape assumed by the resonance-cavities for quality, is illustrated by the exciting influence of a sounding instrument upon a silent one tuned to the same pitch which, although not touched by human hand, sounds in sympathy with the one that is being played on. Even a jar standing upon a mantel-shelf, a globe on a lamp, a glass on a table, or some other object in the room, may vibrate and rattle when a certain note

is struck on the pianoforte. This is the result of sympathetic vibration. Thus, although vocal tone originates within the larynx, it sets the resonance-cavities into sympathetic vibration, and these produce the harmonics that give the fundamental tone its timbre; the resonance-cavities being to the vocal cords or lips what the body or resonance-box of the violin and the sounding-board of the pianoforte are to their strings, the tube of a cornet or horn to the lips, the body of the clarinet to its reed—the resonating factor which determines the overtones and through these the timbre.

Excepting the chest and trachea the resonance-cavities of the voice are located above the larynx. To the chest as a resonator the low tones of the voice owe much of their great volume. Indeed, the chest is such a superb and powerful resonating box that, if it resonated also for the high tones, these, with their inherent capacity for penetration, probably would become disagreeably acute. Therefore, nature, wise in this as in many other things, has decreased chest vibration as the voice ascends the scale.

Above the larynx is the pharynx, a space extending to the base of the skull and opening into the mouth, and higher up connecting with the base of

the nose by means of two passages, the posterior nares, or back nasal passages. The walls of the pharynx are permeated by a network of muscles, so that this important space or resonance-cavity immediately above the larynx is susceptible of numerous adjustments and readjustments in size and shape; and as it lies with its back wall against the spinal column, it also is susceptible and immediately responsive to suggestion from the mind.

Another important resonance-cavity, indeed, the most important, is the mouth, roofed by the hard palate which separates the mouth from the nasal chamber, to which latter it also forms the floor. In the mouth is the tongue, extremely mobile, and thus capable of materially changing the size and shape of the mouth-cavity. Hanging from the rear of the hard palate, like a veil over the root of the tongue, is the soft palate; attached to which is the uvula. This hangs vertically down from the soft palate and, if the rear end of the tongue is allowed to bulge upward slightly, can be made to form with it a kind of valve, by which voice is conveyed directly into the mouth-cavity without any of it escaping up the posterior nasal passage; while the soft palate by itself alone can be drawn up so as to touch the back wall of the pharynx,

completely closing the passage to the nose, so that a continuous curved resonance-cavity is afforded from larynx to lips.

The soft palate is continued on either side by two folds known as the fauces; and each of the fauces has two ridges, the pillars of the fauces, between which are the tonsils. The pillars of the fauces enclose muscular fibres which act respectively on the tongue, the sides of the pharynx, and the upper part of the larynx, and thus aid in the necessary movements of the vocal tract.

The nasal passage, divided into two ducts by a vertical partition, the *vomer septum,* was referred to in the chapter on inspiration. The so-called sinuses are hollow spaces in small bones on either side and above the nasal passage and communicating directly or indirectly with it. A question regarding the nasal cavity, including the sinuses, suggests itself. Of what use is the nasal passage as a cavity of resonance if, in order to prevent a nasal quality of tone, the passage during voice-emission is shut off by the action of the soft palate, or by the combined action of the soft palate, uvula and tongue? The answer is, first, that it is not always to be closed off, because there are times when a slightly nasal timbre in voice is desirable; secondly,

that even when the nasal cavity is shut off, the hard palate being not only the roof of the mouth but also the floor of the nose, its vibrations are communicated to the nasal cavity, but not directly enough to give a disagreeable nasal quality to the voice.

From this survey it will be seen that the cavities of resonance along the vocal tract may be divided into such parts as are solid, pliable and movable. The solid parts are sharply resonant; they are, *par excellence,* the resonators in voice-production; while a pliable part, like the pharynx, although resonant in a less degree, is valuable in adjusting structural shape to every condition that arises; and the most movable parts of all, the tongue and the lips, probably wholly devoid of resonance, have their great rôles to play in effecting what may be called wholesale changes in the size and shape of the mouth-cavity, which could not be brought about by any other agencies less mobile. The roof of the mouth, the teeth, the hard gums, the cones of the nasal passage, and the sinuses are the solid portions of the cavities of resonance. When Svengali gazed into Trilby's mouth and exclaimed, "Himmel, what a roof!" he spoke from the depths of vocal knowledge. For a highly arched mouth

roof, especially if the tone enters the mouth cavity from a wide, well-rounded pharynx, is of great value to the singer. So is a fine, shapely, regular set of teeth, especially as regards the upper front teeth, behind which the vibrations appear to centre in so called "forward production." Cautiously brought into play, the posterior nasal passage assists, with its resonance, the head tones of the female voice and the upper range of male voices; but care must be taken not to carry the tone up into the nose and thus give it a nasal quality.

Some writers class the walls of the pharynx with the solid parts of the vocal tract. But the walls of the pharynx are pliable, as already has been pointed out, together with the admirable results to be derived from their flexibility when under the singer's control. The movable parts of or pertaining to the resonance-cavities are the soft palate with the uvula, the fauces, the cheeks, the lips, the lower jaw and, most mobile of all, the tongue.

The uvula often is too long, either by nature or through a disease called prolongation of the uvula. It can be treated by astringents or the elongation can be cut off, which usually is the most prompt and efficacious way. The operator, however, in case the patient is a singer, must calculate to a nicety

just how much to remove, otherwise the voice will suffer. There are isolated cases of deformed soft palate with uvula so enormous that it cannot be raised. In such cases, one of which is instanced by Kofler, a surgical operation being out of the question, the patient simply has to give up singing.

Enlarged tonsils, whether from inflammation or other causes, also have to be operated on, as their enlargement obviously hinders free voice-emission. Even at its best the mouth-passage here is narrowest—and called the "isthmus"—and nothing must be allowed to make it narrower than it is by nature. The lips never should lie flat against the teeth, since this would muffle resonance. On the other hand, the teeth should not be bared, as this results in a foolish grin. The cheeks naturally conform to the action of the lips. The lower jaw should be relaxed, which gives the so-called "floating chin." When the lower jaw, and with it the chin, is raised, the throat is tightened, and voice-action becomes constricted. The "floating chin" does not, of course, mean that the chin is to be thrust downward into the chest. In singing, as in everything else, there is a golden rule to be observed.

It is obvious that the tongue also is a highly

responsible member of the vocal tract. Raise it too high, and you bring it so close to the hard palate that the mouth becomes too small for free, resonant voice-emission. The tone becomes wheezy. Let the tongue lie too flat, and the mouth-cavity becomes too large and cavernous for tense, vibrant voice-emission. The tone becomes too open. Let the base of the tongue move back too far, and it will tend to close the pharynx and to check free egress from the pharynx into the mouth, making the tone muffled. Raise the back of the tongue until it touches the soft palate, and the two combined close the mouth-cavity from behind, with the result that voice is carried up the nasal passage and is charged with a disagreeable nasal quality.

For every tone produced there is a special adjustment throughout the entire vocal tract. These adjustments should, by practice, become automatic, simple acts of swift and unconscious obedience to the will. Then the question of "forward," "backward," or "middle" production, according to the part of the roof of the mouth where the tone-vibrations appear to centre, will become a matter wholly of the quality of voice which it is desired to produce for any given emotional state. Forward production—vibration appearing to centre a little

back of the upper front teeth—is, as a general thing, the best. Yet a voice brilliant to the point of hardness can be mellowed by middle or backward production. These are matters of judgment. But when I am told, as I was by a young girl, that she was being taught to centre the tone-vibrations "back of her eyes," all I can do is to throw up my hands and exclaim, "O voice-production, what crimes are committed in thy name!" Yes—there should be a Rescue League, or a Society for the Prevention of Cruelty to Singers.

CHAPTER VII

REGISTERS OF THE VOICE

THE subject of vocal registers is a difficult one —difficult to understand and, when understood, difficult to make intelligible to others. In fact, it is so difficult that some people get rid of it by calmly asserting that there are no registers. This is unfortunate, because the blending of the registers, the smoothing out of the voice where one register passes over into another, the elimination of the "break" between them, is one of the greatest problems which the teacher of voice-production is obliged to solve. Like so many other branches in the art of voice-production, the subject is complicated by initial misunderstandings. Numerous people suppose, for example, that the vocal registers are synonymous with the different kinds of voices, and speak of the alto, soprano, bass or tenor register as if register stood for quality, which it does not. Another complication results from the fact that certain phenomenal voices, chiefly tenor, literally rise superior to the law of vocal registers. Thus, a phenomenal tenor like Duprez sang with ease the whole tenor range, including

the high C, in the powerful, vibrant "chest" register, whereas the average tenor, while producing a great portion of his voice in the chest register, is obliged at a certain point in the ascending scale to pass into the "middle" and beyond that into the "head" register.

The breaks that occur in average voices at certain points of the scale have established the divisions of the voice into registers. These breaks can be accounted for on scientific grounds; and if the physiology of voice-production had done no more than explain the why and wherefore of vocal registers, it would have justified itself through this alone.

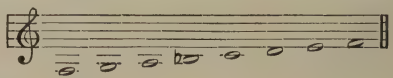
Suppose there were a man able to produce the entire male vocal compass, from deepest bass to highest tenor. While for every note throughout the entire compass there would be subtle changes in the adjustment of the vocal tract, the following also would be true:—That, beginning with the lowest note and throughout the first octave of his voice, the changes in the adjustment of the vocal tract would not alter the general character of the adjustment for that octave; that, on entering the second octave, there would be a tendency toward change in the general adjustment of the vocal tract; while, for

the production of the remaining notes above, an almost startling change in the adjustment of the vocal tract would take place. The same would be true if a woman, capable of producing the entire female vocal compass, were to begin with the lowest contralto and sing up to the highest soprano tone. It is the general character of the adjustment of the vocal tract for a certain range of notes in the vocal scale that determines each register, the two principal changes in adjustment causing two breaks in the smooth progression of the voice.

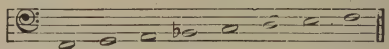
Allowing for the fact that the male voice is an octave below the female voice, but in all other respects corresponds with it in range, the adjustment of the vocal tract throughout each register is the same for both men and women singers. There is, I fear, a prevalent notion on the part of the musical public that each voice has its own separate registers; that, for example, the registers of the soprano voice are at different points of the scale from those of the alto, and those of the tenor at different points from both of these. But this is not the case. Always allowing for the octave difference between the male and female voice, the registers for all voices are at fixed points of the scale and are, or should

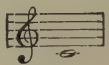
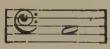
be, sung by all voices with the same adjustment of the vocal tract. A few examples will make this clear.

The lowest register for female voice is:



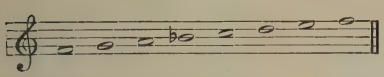
that for male voice:



i.e., an octave lower. These are the first eight notes of the alto of the female voice and of the bass of the male voice. Alto and bass sing these notes with precisely the same adjustment of the vocal tract. The vocal cords in this register vibrate along their entire length, the space between them, also the "cup" and the general adjustment of the vocal tract, are open. A good soprano can come down into this register as far as  and a good tenor as far as  , and when these voices come down into this register they too sing with the same adjustment of the vocal tract as is used for the same tones by alto and bass. This, therefore, constitutes the lowest register for all voices —not because it consists of certain notes, but be-

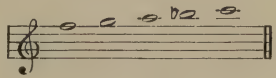
cause these notes require the same general adjustment of the vocal tract for their production by all voices.

When it comes to the next or middle register:—



for female voices (and an octave below for male voices), soprano and tenor sing through this entire register with ease, using a slightly different adjustment of the vocal tract from that which they employed when they went down into the lowest register. The ordinary alto stops at C in this register, as does also the bass at an octave lower. When they enter it their vocal tract adjusts itself to it and corresponds with the adjustment employed in it by soprano and tenor. In this register the vocal cords still vibrate along their entire length, but as the voice progresses upward, they show a tendency to shorten the glottic chink, and the cup, as well as the adjustment of the entire vocal tract, tends to become less open. It is the register of transition, placed between the lowest and highest, as if to bridge over the interval.

The highest register:



(an octave lower for male voice) calls for an extraordinary change in the adjustment of the vocal tract. The vocal

cords are pressed tightly together at the rear and sometimes both at the rear and front. These portions thus cease to vibrate. Only the small free parts vibrate and these only at the edges. As the voice progresses up the scale the stop action ceases, the elliptical opening and the cup become smaller, and the entire vocal tract is, comparatively speaking, contracted. This register practically belongs only to sopranos and tenors. For example, although some baritones are capable of adjusting their vocal tracts to this register, their voices lose the baritone timbre, take on a feminine quality, and become male altos.

In other words, there are three registers, and they correspond for all voices, but certain voices sing more in one register than in the others. Thus, the lowest register is the special province of the alto and the bass; soprano and tenor can come down only a few notes into it. The middle and the highest registers are the special province of soprano and tenor. The ordinary alto and bass can come up only part way into the middle register and cannot follow soprano and tenor at all into the highest.

The division of the registers which I have made is subject to many practical exceptions, which so

far I have avoided mentioning, because I wanted to fix in the reader's mind the fact that the registers are the same for all voices and are determined by the special adjustment of the vocal apparatus required for their production, and not by voice-quality. Now and then in a generation there may appear upon the scene a singer, usually tenor, who for his high notes is not obliged to adopt the somewhat artificial adjustment required by the highest register, but can sing all his tones in the easier adjustments of the lowest or middle register. But he is a phenomenon, the exception that proves the rule. Another practical exception to my rigid division of the registers is furnished by the overlapping of registers, the capacity of a singer to produce the lower notes of one register with the vocal adjustment employed for the higher notes of the register below, and vice versa; so that where the registers meet there are possibly some half a dozen optional notes. Most basses and baritones, for example, sing only in one register, that is, they carry the vocal adjustment for the lowest register into the notes they are able to sing in the register above. These exceptions will be considered later. At present, in order to treat this difficult subject in something that at least approaches an elementary

manner, it is necessary to make the division of the vocal scale into registers a somewhat rigid one.

It is, then, the three different adjustments of the vocal tract which determine the three divisions of the vocal scale and likewise the positions or registers for each division. The basis, therefore, for the division of voice-production into registers is not haphazard, but rests on the science of physiology. That there are not separate registers for men and women is due to the fact that men's voices run parallel to those of women at an interval of an octave below, and that, note for note, the adjustment of the male vocal tract is the same as that of the female vocal tract an octave above. For this reason basses and baritones, although singing an octave below contraltos and altos, sing in the same registers; for this reason also, tenors, although singing an octave below sopranos, employ the same registers. I am, of course, speaking of average voices, not of phenomenal ones.

Mackenzie has defined a register as a series of tones of like quality producible by a particular adjustment of the vocal cords. Mills defines register as a series of tones of a characteristic clang, timbre, color or quality due to the employment of a special mechanism of the larynx in a particular manner.

Both definitions practically mean the same thing. What I object to in them is their use of the word "quality," and Mackenzie's limitation of the adjustment to the vocal cords and Mills' to the larynx. The adjustment takes place throughout the entire vocal tract. Indeed, one of the claims I make for this book is, that it does not limit the voice-producing factor to the vibrations of the vocal cords, but while recognizing the importance of these, also considers the importance of the rest of the vocal tract in relation to them. Other writers hold that voice is produced solely by the vibrations of the vocal cords, and that the rest of the vocal tract is concerned merely with determining the timbre of the voice. But I do not limit the function of the vocal tract below and above the cords simply to voice quality. To produce a given tone requires not only vibration of the cords but an adjustment along the entire tract and especially a change in the size and shape of the cup space. If one wished to be exasperatingly accurate one might say that each adjustment constituted a register, and that in every voice there were as many registers as there are tones. But surveying the progress of the voice up the vocal scale, and as a whole, it is found that up to a certain point the general character of adjust-

ment within the vocal tract is the same, that beyond that point there is a change to another adjustment of a general character, and further beyond still another—in other words, that there are three registers.

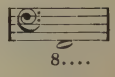
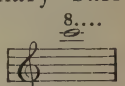
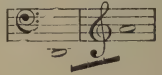
Some writers recognize only two physical changes in the mechanism of the vocal tract and consequently only two registers instead of three. They dispense entirely with the middle register because the general change there in the adjustment within the vocal tract is not, in their opinion, sufficient to determine a new register. In point of fact, however, while the lower vocal range calls the vocal cords into vibration along their entire length, and while for the highest range only a portion of the edges of the vocal cords vibrate, the adjustment for the medium tones shows a gradual change from the first condition to the third. It is a bridge by which the voice crosses in safety from the lowest to the highest register—a register of transition, but a register withal.

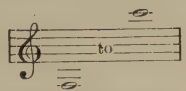
Moreover, as the voice progresses upward through the scale, three distinct physical sensations are experienced by the singer according as to whether he is singing low, middle or high. There is one physical sensation for the lower, another for

the middle and a third for the higher notes. This would indicate that there is, after all, more of a change in the adjustment of the vocal tract for the middle notes than is apparent superficially, and confirms the position of those who hold that there are three vocal registers instead of two.

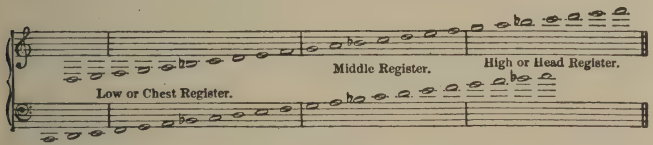
In voice-production of the lower notes there is a physical sensation of vibration in the upper chest; on the medium notes, in the pharynx; on the higher notes, in the head. These physical sensations have determined the names of chest register for the lower and head register for the higher range of tones. Strictly speaking, the middle range should be denominated pharyngeal or throat register, but usually it is called the medium or middle register. In the chest register the vibrations of the vocal cords are slow and heavy; the vocal tract being in its relaxed, open adjustment, the larynx sinks slightly and, the vibrations taking place in their nearest proximity to the chest, they are communicated to it. In the middle register the adjustment of the vocal tract is more closed than in the chest register, the larynx rises a little, the shape of the vocal tract is determined largely by the relative positions assumed by the epiglottis and the soft palate, and the vibrations no longer can communicate

themselves to the chest, but are felt in the pharynx. In the head register the vocal cords come together at one end, sometimes at both ends, and only the upturned edges of the resulting small aperture vibrate, throwing the sensation of vibration up into the head. In every way Nature seems to indicate that there are three vocal registers.

The most extreme limits of human voice so far known were found in the voices of Ludwig Fischer, a bass singer, and of Lucrezia Agujari (La Bastardella), a florid soprano. Fischer created the rôle of Osmin in Mozart's *"Entführing aus dem Serail."* His voice went down to contra F  an entire octave lower than the ordinary bass singer. La Bastardella sang as high as  or an octave higher than what usually is spoken of as soprano "high C." These, however, were marvellous voices, so extraordinary that they form part of the history of singing. Indeed, Baker, in his "Biographical Dictionary of Musicians," credits Fischer with D—a^1 

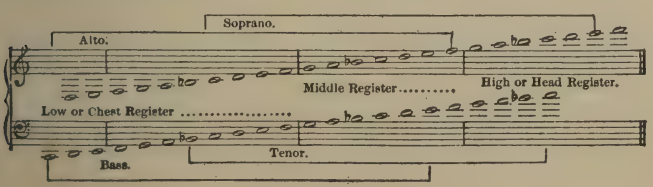
A reasonable statement of the vocal compass would be 2½ octaves, or 

for female voice and the same, an octave lower, for male voice. Allowing for unusual voices, the statement would be as follows:



This musical example shows that save for the lowest note of the bass voice and the three highest of the soprano, the male and female compass parallel each other at an interval of an octave apart, and that the division of the registers is the same for both.

Still utilizing the same musical example, but noting now the two chief divisions of male and female voices (bass and tenor in the male and alto and soprano in the female), the example would be divided as follows:



It must be borne in mind that registers overlap, that they extend up and down one into another, and that at points where this occurs it is optional with the singer in which of the two overlapping registers he will produce his tones. There are many singers who can sing at will the lower half of the middle register either in chest or middle, and the upper half of the middle either in middle or head. It is to be noted, however, that it is easier to bring down a tone from a higher into a lower register than to force up a register, the latter proceeding often being ruinous to the voice.

Duprez, a phenomenal tenor, could, as I have stated, sing the whole tenor range in the chest register. He could emit the *ut de poitrine,* which means that he could sing even tenor high C in the chest register. The result was that half the tenors of Europe ruined their voices trying to imitate him. For they ignored the natural three-register divisions of the voice, and thought they could accomplish with their average voices what is reserved only for phenomenal ones.

There are three registers; and the interrelations between these and the different voices within the male and female range must now be considered.

CHAPTER VIII

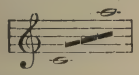
SUBDIVISIONS OF THE VOICE

It should be remembered that in the old days, from which traditions of phenomenally high voices have come down to us, musical pitch was lower than it is now. In those days a tenor, for example, could carry up his voice in the adjustment for the middle or in phenomenal cases even for the chest register, instead of changing to the head register, more easily than can be done now. In fact, nowadays, when a composer calls for a very high note, it usually is transposed, so that actually the supposedly high C of *Di quella pira* nearly always is a B flat. Probably there has been no general deterioration in voices, popular opinion to the contrary notwithstanding. Phenomenal voices always have been rare, and doubtless are no rarer now than at any other period. At any time any opera house would have been proud of two such tenors as Caruso and Bonci, or of two such sopranos as Melba and Tetrazzini, while there is no period in which a Sembrich would not have been a *rara avis*. The artist who, seemingly taught by nature, spontane-

ously employs the correct registers and sings the most difficult music with ease and accuracy, always has been an unusually gifted person—a vocal phenomenon, in fact.

The preceding chapter gave only the main divisions for male and female voices—alto and soprano for female and baritone and tenor for male. There are subdivisions of these. Contralto is a subdivision of alto, mezzo-soprano of soprano; and soprano itself may be dramatic or florid. Baritone is a division of bass; and tenor is either dramatic or lyric. Even when one of these subdivisions of voice is able to enter the range of another, it cannot do the same things with the same ease as the one which naturally belongs there. An alto of extraordinary range, like Schumann-Heink, may be able to achieve high soprano in the head register. It is a valuable accomplishment, insuring ease in singing of rôles that lie in the balance between high alto and mezzo-soprano, but it does not make the singer a soprano. A dramatic soprano may be able to sing florid rôles, but never with the success of the soprano whose natural gifts are of the florid order. A Wagner singer rarely succeeds in the traditional Italian rôles, nor a singer of these in Wagner rôles. Lilli Lehmann always insisted that Norma was one

of her great rôles, and craved the opportunity to sing it here. At last the opportunity came, but it is not on record that the public clamored for its repetition or ranked her *Casta diva* with her singing of Isolde's Liebestod. Melba, one of the most exquisite of florid sopranos, once attempted Brünnhilde in *Siegfried*. One performance, and her good judgment came to her rescue. It is to Sembrich's credit that she always has remained within her genre and for this reason never, so far as I know, has made a failure. The sign-post that stands at the entrance to the path leading to vocal success might read as follows: "Find out what your voice is, and remain strictly within it."

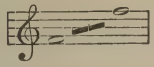
The voice which, because of its great range, best illustrates the three-register division of the vocal scale, is the soprano. The average soprano ranges from  ; but combining the three types of soprano voices, the soprano compass is as given in the previous chapter, the extremes being, of course, exceptional.

Among types of sopranos, the dramatic averages the greatest compass. The voice is heavier than florid soprano and incapable of being handled with the same agility. But it contains more low notes

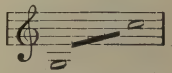
and almost as many high ones, unless in the latter respect one compares it with florid soprano voices of the phenomenal order. Otherwise, so far as the high notes are concerned, the difference lies in quality rather than in compass. The Inflammatus in Rossini's *Stabat Mater,* which is written for dramatic soprano, contains the high C, and no one who has heard Nordica sing it need be told of the noble effect a great dramatic soprano can produce with it.

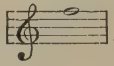
It is possible to sing the three highest notes of the chest register of dramatic soprano with the adjustment for the middle register; and the higher notes of the middle register with the adjustment for the head register. This option is not merely a convenience. Its artistic value is great. In loud phrases those optional notes which naturally lie in the chest register are delivered most effectively in that register; but in *piano* phrases they are more effective when sung with the adjustment of the middle register. The same thing applies to those optional tones which naturally lie in the middle register. In loud phrases they are sung best in their natural register—the middle; in *piano* phrases, in the head register. These are two capital illustrations of the value of the overlapping of registers

and the necessity of training a voice to be equally at home in both registers on all notes that are optional.

Theoretically, the florid soprano produces the three lowest notes of its range in the chest register; the notes from  in the middle; and the notes above these in the head register. In practice, however, the small larynx and the limited cup space found in florid sopranos make it difficult if not impossible for them to adjust their vocal tracts to the chest register. The problem is met by bringing the head register as far down as possible into the middle; and by singing what theoretically should be chest tones in the middle register. It hardly need be pointed out that the lower notes of florid sopranos are weak. This accounts for it. Florid soprano, the voice of the head register, is a voice of extraordinary agility—the voice of vocal pyrotechnics. To achieve it Nature appears to have found it necessary to sacrifice the heavier middle and chest registers which make for dramatic expression; with dramatic sopranos, on the other hand, to sacrifice the muscular flexibility which makes for agility. Mezzo-soprano is a voice that lies within the compass of

dramatic soprano, usually extending neither quite so low nor quite so high, but governed by the same laws.

For altos the ordinary compass is 

A low alto or contralto is supposed to go down to the E below; while altos of unusual range go high as  . I even have seen the alto compass in notation run up to "high" C; but to control this high range an alto would have to be another Schumann-Heink who has cultivated upper notes in the head register. The tone-quality of some alto voices approaches so nearly that of the male voice, especially in the lowest tones of the chest register, that these altos are known as female baritones. In fact there is no voice in which register affects tone-quality as plainly as in alto. For in alto voices the chest register is apt to give tones that are heavy without corresponding vibrance and sonority, while tones produced in the adjustment of the head register are apt to be too thin. The middle register, however, produces in the alto voice a tone that is rich without being too heavy, so that it avoids undue heaviness on the one hand and on the other a thinness that is in no way

comparable with the light tones of soprano, but simply a thin and unsatisfactory alto. Alto tone in the middle register therefore gives the standard tone-quality for alto voice; and when singing in chest or head register, an alto should endeavor to relieve the chest notes of their heaviness and the head notes of their thinness by giving them as much as she can the quality of tones in the middle register. This can be accomplished by bringing head tones down to middle and by carrying the middle register adjustment down into the chest register. But all this is as much a matter of correct ear and trained will power to make the voice reproduce the mental audition as it is of physical adjustment.

The great prizes of the operatic stage and concert hall go to the higher voices—to sopranos, for example, instead of to altos. Yet the proper training of an alto voice is a most difficult matter because, while the chest register is the natural singing register of alto, it produces too "big" a tone—a tone so big as to be heavy and unwieldy. The middle register in alto really is an assumed position, yet it is the register in which the standard alto tone is produced. Teachers who either are ignorant of these facts or disre-

gard them are apt to carry up the cumbersome chest register until it meets the thin head register, producing a voice whose low notes are too heavy and tend toward the uncanny and by no means agreeable female baritone quality, while the higher notes are thin and undecided in character.

The male voice-range is the same as the female, save that it lies an octave lower; its mechanism is the same; and its registers are the result of identical physical functions. Thus, allowing for the octave difference, the tenor voice and the laws that govern it correspond for all practical purposes with soprano.

Tenors are lyric and dramatic, a distinction that explains itself. The lyric tenor is light and flexible. The dramatic tenor is a ringing, vibrant voice, especially on the high notes. Probably it is the splendor of these high notes that is responsible for the theory that they are produced by carrying the chest register upward. In point of fact, a genuine chest register rarely is employed by tenors. Their easiest, their natural singing range, is in the middle register, and the tones which in the notation of the tenor compass are assigned to the chest register, really are sung in what is more like a downward

extension of the middle register. Just as the larynx of the soprano is not as large as that of the alto or contralto and is not capable of the open adjustment required by the chest register, so the larynx of the tenor is smaller than that of bass or baritone and, like the soprano, less capable of the open adjustment for chest register. The result is the same—a perceptible weakness on the lower notes, the great qualities of the voice lying in the middle and head registers, especially in the latter.

The lyric tenor is a lighter voice than the dramatic for the same reason that florid soprano is lighter than dramatic soprano. The cup space within the larynx is, comparatively speaking, small. Thus, while the head tones of the dramatic tenor are powerful and vibrant, the lyric tenor's head tones are lighter and more graceful, but are lacking in brilliant, resonant dramatic quality. A tenor like Jean de Reszke, who sang baritone for several years, must have a larynx somewhat larger than that of a genuine dramatic tenor, and his production of robust tenor notes in the head register must have required a most artistic series of adjustments of his voice tract throughout this entire register. But while it cannot be denied that Jean de Reszke was an artist in the truest sense of the term, it also

cannot be denied that his high voice just lacked the true vibrant tenor quality and had a suspicion of baritone in it.

Some tenors who cannot sing unusually high in head register are able to acquire what is known as falsetto, and even tenors who are not obliged to resort to falsetto sometimes employ it for special effects. Falsetto is produced by carrying the adjustment for head register to its extreme limit. Practically it is the artificial reproduction within the throat of an adult of the small larynx before the period of mutation. In singing falsetto the false vocal cords drop down to within a quarter of an inch of the true cords and even closer, reducing the cup space in the larynx to its dimensions before mutation. To secure a good quality of tone in falsetto the singer must have complete control of the cup space—be able to diminish it not only by allowing the false cords to drop down almost upon the vocal cords, but also by contracting it laterally. If he can do this, he can produce some genuinely artistic effects in falsetto. When a tenor cannot control the muscles that contract the cup space, his falsetto will be of a poor quality—a mere "dodge" to add some higher notes to those of his legitimate vocal range.

There are singers whose control over the registers is so expert that, when they are called upon to follow a loud, singing, vibrant head tone with a *pp* effect on the same note, they can accomplish this by imperceptibly changing to falsetto. They can glide from head into falsetto and back again without a break and add the charm of varied tone-color to natural beauty of voice. This is especially true of dramatic tenors. If they can vary the naturally full and sonorous quality of their head tone with an artistic falsetto, they are able to secure many beautiful effects by an interchange of registers. Whenever the high tones of a lyric tenor sound thin, it is because high head tones do not lie naturally within the singer's range and he is obliged to substitute falsetto for them. "Baritone tenors" usually cannot achieve their higher notes in head register and are obliged to adopt falsetto, but as their voices are naturally fuller than those of the lyric tenor their falsetto is more agreeable.

Falsetto is a remnant of the voice before mutation, the male singer who can produce falsetto having such control over the larynx that he can contract the cup space until it reverts to its original boy size. This accounts for the peculiar quality of the male falsetto—its alloy of the feminine. Boys

sing soprano or alto; and a man's voice must be naturally high and possess such a genuine tenor quality that nothing can rob it of its true timbre, to be effective in falsetto. This is why the average "baritone tenors"—singers who begin as baritones but whose voices lend themselves to being trained up—rarely are able to penetrate an ensemble with a clear, ringing high note of genuine tenor quality. A good tenor falsetto is in fact a reversion to boy-soprano with, however, the quality of adult high voice predominating to such a degree that it has the tenor timbre; and in proportion as the high notes of the male voice result from artificial training instead of from natural capacity, the boy-soprano timbre will creep in and weaken the tenor quality in falsetto. Some basses and low baritones can be trained to reach the high notes of the male vocal compass in falsetto, but as natural facility to produce these notes is lacking in such voices and their production is due wholly to artifice, the reversion to the boy quality of voice is so complete and it predominates to such a degree that these voices are known as male altos.

Falsetto usually is associated with tenors, but falsetto also can be employed by women, the results, as with men, depending on whether the voice is nat-

urally a high one or not. I repeat that with voices which naturally are high, falsetto is not a "dodge," but a legitimate artistic effect. Furthermore, singers who in addition to control of the regular registers have control of falsetto, frequently find physical relief in passing from head to falsetto and back again.

Basses are of three different kinds. Basso profundo is the lowest bass; basso cantante is a flexible bass usually unable to sing quite as low as basso profundo; baritone is the highest bass—a voice midway between bass and tenor and partaking somewhat of the quality of both. The bass compass parallels that for contralto and alto at an interval of an octave and, in their use of the registers, basses and contraltos and baritones and altos have much in common. As with contralto, the natural singing register of basses is the chest register. The middle register is awkward to establish in bass voices, as the size of the larynx gives a large open cup space which is unsuited to the chest register. Therefore, with basses, when the capacity of the chest register is exhausted, it is best for the production of the notes above to make a complete change of adjustment to head register. Thus in bass the middle register practically is eliminated.

The high bass or baritone compass is from It was seen that the question of registers with altos and contraltos was a complicated one, and similar complications exist with baritones. Some baritones can employ the middle register with ease, so that like certain contraltos they can sing in three registers—a rather weak chest register, middle and head (or falsetto) registers. The training of baritones is difficult, and should be determined by the tendency of the individual baritone voice—whether it inclines toward bass or toward tenor. For example, Jean de Reszke was at the beginning of his career the victim of faulty voice diagnosis. He was pronounced a baritone and trained for baritone rôles, with the result that he suffered from an exaggerated condition of fatigue after every appearance. Later the probable tenor quality of his voice was discovered, and when it had been developed along physiological lines best suited to its real quality, undue fatigue after using it ceased.

The division of the vocal scale into registers is not an artifice. It is Nature's method of assisting vocalization, her way of relieving the strain of the voice. A certain portion of the vocal scale lies nat-

urally in the chest register. But if this open adjustment is carried up too far, the tones are strained and eventually ruined. On the other hand if, at the proper point, the singer passes into the middle register, the strain is relieved; and the relief experienced is even greater when passing from middle into head, entirely releasing one set of muscles and calling an entirely new set into play.

The so-called "breaks" in the voice occur at points where one register passes into another; and it should be the aim of proper instruction in voice-culture to eliminate the breaks. They are due to the change in adjustment which each register calls for. The best method of "blending the registers" —of smoothing out the breaks—is to bring a higher register several tones down into the one below and thus bridge over the passage from one adjustment to another. To do this consciously would defeat its aim. It must be done in spontaneous response to the mental conception of the tone or phrase to be emitted. It must become second nature with the singer, a physiological adjustment in answer to a psychical concept—a detail, in fact one of the most important details, in that true physiology of voice-production which also takes psychical conditions into consideration.

CHAPTER IX

THE STROKE OF THE GLOTTIS

THE *coup de glotte,* translated as "stroke of the glottis," refers to the manner in which a note should be attacked. This matter of attack already has been covered by inference many times in the course of this book. For, as the effectiveness of vocal attack depends upon the way in which the air-column strikes the vocal cords, it follows that the advice constantly given and in accordance with which the entire vocal tract of the singer should adjust itself as if by second nature to the tone that is to be produced, each time places the cords in the correct position to receive the stroke of the outgoing air. It does away with all danger of the "audible stroke" which occurs most frequently on the very open vowel-sounds, when the air reaches the glottis too late and is obliged to force its way through, the result being a disagreeable click; and it also obviates the defect from the opposite cause, when the air passes through the glottis too soon and results in an aspirated sound, an H before vowels, the voice, for example, emitting "Hi" for "I".

Mackenzie remarks on these points that the great object to be aimed at is that no air should be wasted or expended improvidently; that just the amount required for the particular effect in view must be used. Too strong a current tends to raise the pitch, a result which can be prevented only by extra tension of the vocal cords, which, of course, entails unnecessary strain. Again, the air may be sent up with such velocity that some of it leaks through before the glottis has time to intercept it; or with such violence as to force the lips of the chink a little too far apart. In either case so much motive power is thrown away and to that extent the brilliancy and fullness of the tone are lost. The *coup de glotte,* or exact correspondence between the arrival of the air at the larynx and the adjustment of the cords to receive it, is a point that cannot be too strongly insisted on.

"The regulation of the force of the blast which strikes against the vocal cords," says Mackenzie, "the placing of these in the most favorable position for the effect which it is desired to produce, and the direction of the vibrating column of air, are the three elements of artistic production. These elements must be thoroughly coördinated—that is to say, made virtually one act, which the pupil must

strive by constant practice to make as far as possible automatic." Extend this admirably expressed paragraph to the entire vocal tract instead of limiting it simply to the vocal cords as Mackenzie does, and it covers the problem of attack. It is not only the vocal cords that should set for the tone at the moment the air-column strikes them, the entire vocal tract takes part in the adjustment that prepares for the attack. It is indeed, as Mills says, a case of complex and beautiful adaptation. Therefore, the term *coup de glotte* imperfectly expresses what the modern physiologist of voice means by attack. For *coup de glotte* conveys the idea of shock, hence creates an erroneous impression upon the mind of the singer. It is spontaneous adjustment, and neither shock nor even attack, that creates artistic tone.

"Voice and Song," by Joseph Smith, expresses very well the combined psychical and physical conditions that should prevail at this important moment. To be certain of a good attack, the student should first think the pitch, then, with all the parts concerned properly adjusted, start breath and tone simultaneously, striking the tone clearly and smartly right in the middle of its pitch. The book also describes the three faulty ways of attack: (1)

the vocal cords approximate for the production of the tone after the breath has started, resulting in a disagreeable breathy attack; (2) the glottis closes so firmly that the attack is accomplished by an extraordinary explosive effect or click; (3) the vocal cords seek to adjust themselves to the pitch after the tone has started, and produce a horrible scoop in the attack. One of the worst faults in singing, the tremolo, is due to that unsteadiness of attack which results when the relationship between the breath and the laryngeal mechanism is not maintained—when the vocal tract has not been adjusted in time to the note the singer is aiming to produce.

Another writer who has a correct conception of what occurs at the important moment of attack is Louis Arthur Russell, who says that the musical quality of a tone is due, 1st, to its correct starting at the vocal cords; 2d, its proper placement or focus in the mouth after passing through the upper throat, etc.; 3d, its proper reinforcement through resonance and shape of the mouth cavities; and 4th, its support by the breath. While this seems to describe four successive adjustments, they are so nearly simultaneous as to be one. This is clearly recognized by Mr. Russell, who says further, that what he has described implies that the body has been put into

condition and that everything is in order, alert, responsive and ready for the call of the will; that the whole body is in singing condition; that everything is in tune, and that the one tone wanted is all that can ensue. The last is especially well put. Everything has been made ready—psychically and physically—for the production of artistic voice, and nothing but artistic voice can result—no click, no aspiration, no tremolo, no wobble.

The vocal tone in its passage strikes against the walls of the vocal tract. That part of the tract upon which it last impinges before issuing from between the lips determines the placement of a tone. The singers should think of the tone as focussed upon the front of the hard palate—behind the upper front teeth at about the point where the roof of the mouth begins to curve down toward them. If the tone is placed further forward than this, its quality will be metallic; if too far back, throaty. To impinge the tone near the nasal passage gives it a nasal quality, a fault most common with the French, acquired probably through the necessity of singing certain French words—*bien,* for example —through the nose. When, however, the French speak of singing *dans le masque,* they should not be understood as implying that tone should be nasal in

quality, but that it should be projected both through mouth and nose and not unduly through either. As a rule, nasal placement should be avoided by all but the most experienced singers, and even by them employed only sparingly and only for passing effects in tone-color.

The individual formation of the lips would seem to have much to do with their position in singing. Some singers advocate a lip formation that gives an opening like an O; others lay the O on its side ⬭ like an ellipse. The former represents the lip position of Nordica, the latter of Sembrich—so that, as I have said, it is largely a matter to be determined by the individual. But the singer who uses the elliptical position must guard against exaggerating it, as it then results in the "white voice," another frequent fault of French singers.

After all, the final test of tone-production, tone-placing and position of the lips is the quality of the tone produced; and this is determined at first by the sensitive ear of the skilful teacher, and eventually by the trained mental audition of the pupil. The old Italian singing-teachers have been greatly praised because they are said to have reasoned from tone to method and not from method to tone. Those who praise them thus, usually intend their

praise to be, incidently, a condemnation of anything like a scientific method of voice-production. In point of fact, however, the modern physiologist of voice-production is not an advocate of too fixed and rigid a method. He, too, proceeds from tone to method, and he goes even further for his tone than did the old Italian masters. For whereas they began with the tone as it issued from the singer's lips, the modern physiologist of voice-production begins with the singer's mental audition—with the tone as the singer conceives it and to which his vocal tract should automatically set or adjust itself even before the breath of phonation leaves the lungs.

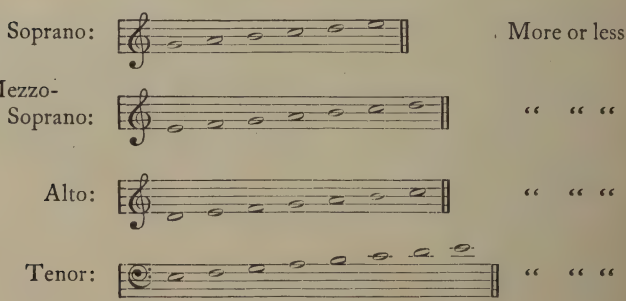
With the beginner, the attack should first be performed on the easy singing notes of his voice; and although this book does not aim to be a singing-method, but rather a physiological basis for one, it may be said here that *a,* pronounced as in *"ah"* and preceded by *l*—that is to say, *lä*—makes an admirable vowel-sound and syllable on which to begin training the voice. The vowel-sound alone is too open. An absolutely pure tone can be produced upon it, but it will lack color. It will be a pure tone, but otherwise uninteresting. With the consonant added, it obtains color and gains interest. Voice is indebted in an amazing degree to the

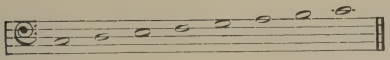
consonants. Sing the phrase "I love you," and put the emphasis on "you," which, for practical purposes, is a pure vowel-sound. The emotional vocal effect will not be nearly so great as when the emphasis is put on "love" in which the vowel *o* is colored by the consonant *l*.

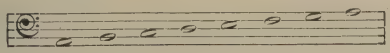
This can be explained physiologically. All vowels primarily are made in the larynx by the vocal cords. The *coup de glotte* really is the process of vowel-making without the aid of consonants. This process of vowel-making is so smooth and open that a succession of legato vowel-sounds can be produced with only one stroke of the glottis, the vowel sounds flowing into each other, or each, seemingly, issuing from the other. Consonants are formed within the upper cavity of resonance, the mouth, some by the tongue alone, some by the combined action of tongue and lips. Voice-color being largely determined by the resonance-cavities, the articulation of consonants in the resonance-cavity of the mouth covers the open process of vowel-formation and gives color to the resultant word and tone. Thus, when "love" is sung, although *l* is not a strong consonant but one of a small group called subvocals, it is sufficient to cover and color the open *o* production.

The easy singing range of each individual voice usually is about identical with the pitch of its possessor's speaking voice. Training should begin with the highest tone of the easy singing range. The reason for this is that the higher tone requires a certain muscular tension which places the singer, so to speak, on the *qui vive* to the importance of the task before him; whereas the greater relaxation on the lower notes might cause him to regard the problem as too easy. At the same time the higher note, still lying within the easy singing range, does not call for a strain but simply acts as a spur.

Kofler gives six examples of easy singing ranges for as many voice-divisions, and adds to each the qualification "more or less," thus allowing for differences in individual voices. His easy singing ranges are as follows:



Baritone:  More or less

Bass:  " " "

Reference having been made to vowels and consonants, it seems proper to add at this point something about diction in singing. The interpretation of a song is tone-production applied to the emotional significance of words. There seems little reason to doubt that the old Italian masters sacrificed many things, clarity of diction included, to beauty of tone. This they placed above everything. True, beauty of tone is the first essential of artistic singing, but it is not the only essential. If song is speech vitalized by music, then speech, the words to which music is set, has some claim to consideration. In fact, the singer's diction should convey the import of the spoken word with the added emotional eloquence of music.

Indeed, even some of the earliest Italians recognized this. Caccini, at the beginning of the seventeenth century, broke away from the contrapuntal music of the church because it made the words unintelligible. Tosi, who published a vocal method in 1723, a little less than a century and a quarter after Caccini's declaration, still insisted on the im-

portance of clear diction. "Singers should not forget the fact," he wrote, "that it is the words which elevate them above instrumentalists." But with the introduction into Italian music of florid ornamentation, which of itself made the words more or less unintelligible, they lost their due importance, until, as many an old opera-goer still can testify, a tenor like Brignoli could, without protest, habitually allow himself the liberty of substituting "la" for the words on all high notes and phrases, simply because he found it easier to sing them on that syllable. At song recitals, the words of the songs often are printed on the programmes. Printed translations of words sung in foreign languages serve an obviously useful purpose. But when an English-speaking singer prints the words of English songs on his programme, it virtually is a confession that he does not expect his hearers to understand what he is singing to them in their own language—so rooted in singers has become the evil of indistinct pronunciation. Their songs are songs without words.

However, there has been an improvement in this respect. The old-time opera libretto was so stupid that Voltaire was justified in saying, "What is too stupid to be spoken is sung." But with Wagner the

importance of making the words clear to the hearer was recognized, and since his works have established themselves in the repertory of the operatic stage, and modern opera composers, following in his footsteps, have striven to write music that would express the dramatic significance of the words to which it is composed, the art of libretto construction has greatly improved, and composers demand that the singer shall convey to his audience some idea of what is being sung.

Similar progress has been made in song-composing and song-interpretation. Just as the Italians formerly strove mainly for beautiful tone-production without much thought of the underlying word or phrase, so song-composers strove for beautiful melody—for music that was satisfying in itself, whether it suited the verbal phrase or not. Now, as in opera so in song, the relationship between words and music is recognized and the importance of combined verbal and musical phraseology is insisted upon. Formerly, interpretation was a matter of emotion only. Now, the intellectual process, the intelligence that discriminates, the thought that justifies the singer's emotional expression as that fitted to the words, are weighed in the balance. Consequently the word must be clearly pronounced by the

singer. Vowel enunciation and consonant articulation—pronunciation being a combination of these two processes—must be distinct, or rather should be distinct, since there still is much fault to be found with singers in this respect.

Much has been said, especially by American singers, about English being a poor language for song. I think this is a survival of the time when song instruction in this country largely was in the hands of foreigners, mainly Italians. Naturally they preferred their own language, and naturally they failed to appreciate the genius of English. It is true, as Kofler says, that the Italian language presents few difficulties to the singer. In it, pure vowels predominate and consonants are in the minority, and even then many of these consonants are vocal, while the hard aspirates of other languages, especially German and English, are unknown to Italian lips. But that which is easier, by no means is always the most artistic. Ease rarely leads to depth. And this ease of pronunciation may account for a lack of dramatic grandeur and vigor in Italian and for the Italian's method of tonal emphasis and vehemence of gesture. "The German or the English artist has no need for such extravagances, because the immense richness of these

languages—the great variety of vowels and the vigorous aspirated elements—gives to his utterance a dramatic freshness and force which are life and nature itself.

"The English language is probably the one that has been described by foreigners as the most unfit for singing. Greater calumny has never been uttered. I contend for just the opposite: That English is the very best language for an artistic singer to use, for it contains the greatest variety of vocal and aspirate elements, which afford an artistic singer the strongest, most natural and expressive means of dramatic reality. The English language has all the pure vowels and vocal consonants of the Italian; and, besides, it is full of rich elements, mixed vowels, diphthongs and an army of vigorous aspirates. I admit that it is not as easy for singing as Italian is; but just here its true merit and advantage arise. The difficulties thus forced upon the singer compel him to study deeply and perseveringly; but the treasures thus unearthed and placed within his reach will amply repay for hard work. My advice to American students is: Study your own language thoroughly, and practise its difficult articulation with the utmost fidelity. If once you find the application of its forces to dramatic expression,

you will like it for singing as well as I do. But never forget that the appreciation of a science comes only from a thorough mastery of it."

The truth of the matter is, that each language has its own peculiar genius for song, and that a vocal composer unconsciously is under the influence of his native language. Italian music is as smooth as the Italian tongue; French music has the elegance of the French language; German the ruggedness of the German; and the music of English composers also partakes of the characteristics of the language. The highly trained modern singer should be a linguist as well as a vocalist. As for the amalgamation of the spoken word with the sung tone—that again is a matter of unconscious adjustment of the vocal tract; and, not to word and tone separately, but a single adjustment to what I may call "the word-tone."

CHAPTER X

HYGIENE OF THE VOICE

I SHOULD say that no one should be more scrupulous in his habits than the singer. It is more difficult to keep the keen edge of the voice in good repair than that of the sharpest razor, and nothing should be done to dull it. No one more than the singer requires to observe the moral and physical laws. The singer should always be in training, always in the pink of condition. By nature, women should be more subject to impairment of voice than men. But they are not. They are brought up to take better care of themselves and, to put it bluntly, to behave themselves better. As a result, in spite of recurring disorders, they stand up and do the work demanded of them when men do not or cannot.

Every pupil should be instructed to fall naturally into an attitude of attention when coming into the presence of the teacher—as much so as in the presence of a distinguished host or hostess. *Morale, esprit de corps,* cannot be instilled too soon. They may well be considered psychical elements in general vocal hygiene.

Personal cleanliness is, of course, one of the first requisites to health. But, while bathing should be regular, it should not be extreme. A cold bath stimulates at first, but is followed by a bad reaction in a few hours. A hot bath, followed by exposure to the open air or a draught, is apt to develop a cold by night. I recommend for singers a lukewarm bath.

When singers have had their hair cut, they should watch themselves carefully for the next twenty-four hours. If possible, they should have it cut shortly before going to bed and should protect the head with a light hood. Some singers catch cold every time they have their hair cut, and bald-headed singers always are catching cold. And while on this subject, it cannot be stated emphatically enough that any hair tonic that stimulates the scalp too much is bad. The glands in the scalp absorb the lead, cantharides, cayenne pepper, or whatever the specific poison in the tonic may be; this is carried to the respiratory tract, and creates the symptoms of a cold.

Singers are not apt to take much exercise. For this reason they should be careful in their diet. They should avoid beef, lamb and mutton. The white meat of fowl is the best meat diet for the

vocalist. Milk, eggs, toasted bread, string beans, spinach, lettuce, rice and barley are excellent. Potatoes should be mashed, with milk and butter. Fruit is better taken stewed and with little sugar. Ice cream clears the voice for about twenty minutes, but the reaction is bad.

Regarding tea and coffee, inasmuch as a singer is not a cat on a back fence, but a human being, there is no reason why he should not be permitted to follow the social law in respect to these, provided he is not a sufferer from indigestion. In fact, there are times when a cup of coffee taken at the right moment will carry a singer, tired from travel or other cause, over a crisis. There can be no harm in a cup of coffee (Java and Mocha mixed), a cup of Phillip's Digestible cocoa, or a cup of tea (Oolong or Tetley's Ceylon) for the singer who is in good condition.

I always have held that a singer could drink a small quantity of alcohol—claret, for example—if he takes with it enough lithia or other alkaline water to counteract the acid in the wine. Smoking, however, is very injurious. A famous tenor of today whispered during a performance in the Metropolitan Opera House to the prima donna in the cast, "I smoked too many cigarettes yesterday; I

feel it in my voice." Myron W. Whitney always left off smoking for two weeks before the Worcester Festival.

For travel the singer should be prepared for atmospheric changes as no one else in the world. He should be especially cautious at night. A singer who filled an engagement in Savannah started from there for the North at night. He had been in perfect voice. As the night was warm he left one of the windows of his berth open. At Washington he woke up with cold. It was snowing, and snow had come in through the open window on to his berth. His nose was "stuffed." He had no voice when he reached New York. This was due to the sudden intensification of all the things that belong to a cold. If he had worn a dressing-gown with a hood—not necessarily a heavy one—that would have saved him. A garment of that kind should be worn by singers at night when traveling. They can regulate the bed-covering accordingly, so as not to be too warm.

Clothing should give correct aeration for the season. Silk underclothing I regard as dangerous, because silk is a non-conductor. Good Lisle thread or flannel giving proper aeration is excellent. No one should be more careful about their clothing than

New Yorkers, because of the sudden changes in temperature there. Stiff, high collars are injurious, because they are irritants to blood-vessels and nerves and are non-conductors. Collars should be worn from a quarter to half an inch away from the skin, for the less the Adam's apple—the highest forward point of the larynx—is irritated, the better.

There are certain periods of the year and even one special day when singers should especially look out for their voices. From January 15th-20th is the period of January thaw and of colds from melting snow. From March 19th-25th the earth is beginning to ferment and this is a period for spring fever and intestinal troubles, which indirectly affect the voice. May 9th usually is cold and rainy. The latter part of May and nearly all June, rose cold or June cold is prevalent. About August 1st come the dog days and hay fever. In fact, from August 1st until the autumnal equinox is an anxious time for the singer. From November 11th-25th there is apt to be alternate cold and warm weather conducive to asthma.

With the singer, more even than with any one else, the ounce of prevention is the pound of cure. The first sneeze should send the singer to his phy-

sician; and he also should realize—as only too few people do—that after a cold nature requires from a week to nine days to repair the damaged processes, and that he should not work too soon. Rest is a great cure.

One of the most distinguished French laryngologists, Dr. G. Poyet, was interviewed for the European edition of the N. Y. *Herald* on the subject of hygiene for the singer. Although what Dr. Poyet says on some points is a repetition of matters already gone over here, while other points will be more thoroughly gone into than was possible for him in the space at his command, a summary of what this clever man had to say on a subject of such importance to the singer will serve capitally the purpose of this chapter.

Dr. Poyet began by saying that, since the voice has intimate relationship with the entire organism, it follows that a well-understood hygiene should concern the totality of the functions. First of all, it is indispensable to avoid any cause of disturbance of the circulation, and particularly of the pulmonary functions.

"The singer, as much as possible, should inhabit sufficiently large apartments. He should avoid rooms warmed by apparatus which may produce

carbonic acid or which remove from the air the watery vapor it contains normally. Every day on rising he should practise exercises in deep breathing and, if possible, some of the gymnastic exercises which it is possible to practise in a room. Walking is undoubtedly the best exercise, and every singer who is careful of the soundness of his lungs—which is equivalent to the soundness of his voice—should walk for an hour every morning before his repast." (This advice of Dr. Poyet can hardly be taken literally, and should be determined largely by the physique of the individual.)

In order to avoid colds, bronchitis, sore throat, catarrhal laryngitis, the singer should regulate in a fitting manner the thickness of his clothing in accordance with the prevailing temperature. If by misfortune he catches cold, a little laryngitis, a coryza, all of which cause hoarseness, he should immediately abstain from singing. Neglect of this rule may bring about the persistence of vocal accidents often very long in curing. It is because professional singers cannot interrupt their work in such cases that they more often than any others suffer from laryngitis and above all in the so dangerous form of chronic inflammation of the vocal cords, which determines the deplorable "singers' nodules."

The cutaneous secretions should be watched in persons who have need of a clear voice. Almost all catarrhal affections of the respiratory organs are due to chills. Advice is therefore given to every person who has practised violent singing-exercises, which cause perspiration, immediately to change his clothing after having been rubbed down with a horsehair glove or with flannel sprinkled with alcohol.

Like the respiration, the alimentation ought to be watched by the singer. As much as possible during the process of digestion no violent or prolonged singing-exercise should be undertaken. Digestive troubles are often the cause of deterioration of the voice, either because the swelling and distension of the stomach by gas trammels the play of the diaphragm, and consequently that of the lungs, or because intestinal troubles bring on constipation or diarrhœa.

Very nutritive and very digestible food should be chosen for a singer, and a mixed alimentation should be employed. Among drinks preference should be given to wine and beer. Alcoholic liquors, Dr. Poyet thinks, should be absolutely forbidden. However, he advises a singer in the course of a fatiguing performance sometimes to moisten

the throat with, and even to take a few mouthfuls of, cold water, to which has been added a little old cognac or "vin de coca"; but never, on any account, to take an iced drink just after singing.

Everybody who sings ought first to observe in the strictest manner the rules of general hygiene. Thanks to this hygiene it is possible completely to develop all the faculties of the larynx and to regulate the voice in such manner as to assure its regular operation. General hygiene, moreover, will permit the singer to preserve himself from the external influences which may bring about aphony or dysphony, that is, loss of voice or difficulty of voice.

A person who sings should always assume a natural attitude, since this aids the play of the respiratory organs. This play should be mixed, that is to say, costal and diaphragmatic. The respiration should be well regulated. The singer ought never to take too sudden inspirations, for he would thus run the risk of rapidly irritating the vocal cords. When it is a question of vocal exercises, one always should proceed from the simple to the complex, taking care not to prolong the exercises at the beginning. That is, the first singing-exercises should not be too prolonged. Moreover,

in these first exercises the singer should never attempt to attain the extreme notes of his vocal range. The exercises should lie in the middle register.

Keen impressions, whether of joy or pain, are, in Dr. Poyet's opinion, bad for the voice. Great fear may cause a passing but instantaneous loss of voice. "Vox faucibus hæsit." The emotion of singing in public, as everyone knows, prevents many artists from showing their full capacity. Only custom, and sometimes reasoning, can free them from "stage-fright."

People who sing, and who desire to preserve the integrity of their voice, should abstain from smoking. Because some singers—Faure, in particular—have had a brilliant career despite the inveterate use of tobacco, there is no reason that this example should be followed. Tobacco irritates the pharynx, reddens the vocal cords, and may cause heart troubles harmful to singing.

Pungent scents should be proscribed for singers. The odors of some flowers are for certain artists the cause of persistent hoarseness. Mme. Carvalho could not endure the scent of violets, which instantly caused her to lose her voice. Scents often determine a rapid congestion of the mucous mem-

brane of the nose to such an extent that in certain persons they cause veritable attacks of asthma. Dr. Poyet also puts singers on their guard against scented toilet powder. "I knew," he says, "a great singer who was obliged to renounce the use of the toilet powder called 'à la Maréchale.' "

In ending the interview, he calls attention to the fact that the larynx, while very delicate, is an extremely resistant organ, since it can face fatigues that no other human organ could support; but because it shows signs of fatigue only by hoarseness, is no reason to call on it for too prolonged efforts. "To work two hours a day, either in study or in singing, seems to me a maximum that should not be overstepped by a person careful of his vocal health."

Another distinguished foreign specialist is Dr. N. J. Poock van Baggen, of The Hague, Holland, who has contributed to the *Medical Record* a series of articles on throat diseases caused by misuse of the voice, and their cure.*

Clergyman's sore throat, as Dr. Van Baggen says, is a disease known to every throat specialist.

*These articles have been reprinted in four slim but interesting pamphlets published by William Wood & Co., New York.

"It is produced by misuse of the voice, and the same disease, often in more aggravated form, is produced in the singer and by the same cause. The patient, after singing, will experience a dry and hot feeling in the pharynx and larynx, irritation, and a frequent cough. Examination of the patient discloses catarrh of the pharynx and of the larynx; congested and swollen mucous membrane; pillars of the fauces swollen and unduly developed; all these symptoms accompanied by paresis of the vocal cords, which are red or yellow and do not approximate well. To this paresis of the cords is united a paresis of certain muscles of the larynx; to which is added, in serious cases, a swelling of the aryepiglottic ligament."

That this disorder is not organic, but functional —not caused by enlarged tonsils, adenoids, nasal polypus or malformation of the tongue, but by misuse of the voice—can be proved by the beneficial effect produced upon the organs by complete rest from singing; the symptoms sometimes disappearing entirely, only to reappear, however, when singing is resumed—further proof that misuse of the voice is at the root of the evil.

"Dividing the muscles into those used in breathing, in articulation of consonants and in vowel

enunciation, the physician will find that in his patient there is no proper coördination between these three groups of muscles—that through faulty respiration and articulation the respiratory and articular muscles fail to support sufficiently the vocal muscles, with the result that the vibration of the vocal cords is weakened. One fault begets another. The faulty use of the respiratory muscles directs the vibrating air-column to the soft palate, where the tone is so smothered that the singer has to overexert himself to be heard, instead of directing it against the hard palate, where it would gain vibrance and carrying quality."

The faulty use of the muscles of articulation is disclosed when the back of the tongue rises like a flabby partition between the opening of the mouth and the pharynx, the consonants being formed thereby far back in the mouth, instead of forward with the tip or middle of the tongue leaning against the hard palate. The articulation is, in consequence, thick and dull. The vocal muscles are contracted to an unnatural degree, and every vocal tone is accompanied by an audible shock or spasm of the glottis. All this adds to the exertion required of the singer to make himself heard, an exertion and strain which eventually result in the symptoms that

have been described, and which most singers believe due to colds and other troubles, whereas they are the result of the singer's own misuse of his voice.

I have said that correct breathing is one of the fundamentals of correct voice-production. No wonder, therefore, that incorrect breathing is one of the most potent factors in the misuse of the voice that sends the singer as a patient to the physician. I have stated that there are three kinds of breathing—clavicular, costal and diaphragmatic; and these have been described. It has also been pointed out that the teacher who instructs in one kind of breathing to the exclusion of the other two makes a serious mistake. For in correct breathing, all three are coördinated. Usually it is spoken of as mixed costal and diaphragmatic. In truth, however, it is mixed costal, diaphragmatic and clavicular; but, aside from the awkwardness of combining all three terms in characterizing correct breathing, the clavicles play a less important part in it than the diaphragm and the ribs. In their relative importance to correct breathing the diaphragm comes first, the ribs next and then the clavicles. I feel certain that Dr. Poyet means the coördination of the three when he speaks of mixed costal and diaphragmatic breath-

ing, and that Dr. Van Baggen also means this when he speaks of diaphragmatic breathing. In fact, his description of diaphragmatic breathing involves the ribs; and if he omits mention of the clavicles, this may be explained by the slight part they play in correct breathing, merely topping off, as it were, the action of diaphragm and ribs.

Dr. Van Baggen, in the breathing-exercises which he describes as beneficial for restoring a voice impaired by misuse, lays emphasis on the control of expiration and on the brief retention of the breath before exhaling it. In his first exercise the abdomen is pushed forward and contracted, the idea of breathing being excluded in order to concentrate attention upon making the movements correctly.

The second exercise consists of these same movements, but now combined with inspiration and expiration through the nostrils. When first started, the exercises are limited to a few minutes four or five times a day. When this method of breathing has become natural to the patient, there is added the brief retention of the breath and expiration under control—that is, gradual expiration. This constitutes the third exercise.

In this it is recommended to inhale slowly through the mouth, which should be in position to

pronounce *f*, that is, not too open. Hold the breath while mentally counting three. Exhale, pronouncing a prolonged *s* and finishing on *t*. The pronunciation of *f* during inhalation and of *s* and *t* during exhalation is advised in order to provide evidence that inhalation and exhalation are carried out evenly and without shaking or breaks.

Built upon this is the exercise for teaching the vocalist to inhale quickly, hold his breath a brief space, and exhale as slowly as possible, as must be done in singing. The inspiration now is through the nostrils; the pause is not quite so long, but the expiration on *s* and *t* is longer—say as mentally counting 40 would compare with counting 10.

Whoever has read carefully the chapters on breathing in this book will have discovered by this time that the breathing-exercises just described lead up to the principles of artistic breathing set forth in those chapters; and that whoever has read them and will carry them out never will require breathing-exercises to correct misuse of the voice from that source, because his breathing will be absolutely correct. The same is true of the exercises given by Dr. Van Baggen to make the breathing-muscles cooperate with the articulation and vocal muscles. Nevertheless, since there are people who do not

read carefully, or who go along in the same old faulty way until brought up suddenly by the dire effects of misusing the voice, I may add that Dr. Van Baggen's exercises for articulation will be found in detail in the pamphlets mentioned.

When a singer who is suffering from misuse of the voice comes to a specialist for treatment, the specialist must for the moment become a singing-teacher and instruct the singer in the artistic co-ordination of breathing, articulation and vocal muscles. The patient, having gained proper breath-control and having had impressed upon him the importance of forward placement and of the normal position of the tongue to correct articulation of consonants, is ready for correction of the faulty action of the vocal cords. This faulty action is due chiefly to faulty attack—a faulty *coup de glotte*—manifest mainly on initial vowels in an audible stroke, shock or check and in the emission of unvocalized breath. This latter is the so-called *spiritus asper,* because the emission of unvocalized breath which precedes phonation gives an aspirated or *h* sound, so that, instead of *ah,* we hear *haa.* The *spiritus asper* is caused by a too slow contraction of the vocal cords and their too gradual approach for phonation.

In the audible shock of the glottis (sometimes called the "check glottid") the vocal cords are pressed together and the retained breath causes a shock or explosion. Dr. Van Baggen says that the vowel which is thus formed might be called an articulated vowel, which accurately describes the effect, the vowel being enunciated with the circumstance of the articulated consonant instead of with the ease of the phonated vowel.

With a normal attack—the *spiritus lenis* in contradistinction to the *spiritus asper*—the glottis is in position for phonation at the moment breath passes through it. No unvocalized breath precedes it and no explosion follows it. The vowel-attack is clear, precise and distinct. Not only is the voice-emission pure, but there is no needless fatigue of voice, because all superfluous movement of the glottis is avoided.

The "check glottid" or glottic shock, on the other hand, involves an undue effort of the vocal muscles, and the compression of the vocal cords causes irritation. The audible shock of the glottis cannot be avoided when it is necessary to accentuate a word beginning with an initial vowel. Constantly used, however, it is part of the misuse of the voice. Dr. Van Baggen recommends, as a method of cor-

recting the too frequent use of the audible shock, that when a word beginning with an initial vowel appears in the middle of a phrase, this word should be united to the preceding one, somewhat after the manner (but more lightly) of the French verbal "liaison," in which the final consonant of a word becomes the initial consonant of the following word beginning with a vowel. For example in "vous avez," the *s* of "vous" is drawn over to and pronounced with the *a* of "avez," the effect being "vou-z-avez." If the phrase that is to be sung commences with a word beginning with an initial vowel, care must be taken to employ the normal *coup de glotte,* or *spiritus lenis.*

Although I have devoted two chapters to the registers of the voice, I shall also quote Dr. Van Baggen on the faulty use of these and the physical ills that result therefrom, since there are but few singers who do not know the difficulties which the registers of the voice offer; and many who spoil their voices forever by the misuse of those registers. Generally, the misuse consists in the exaggeration of a lower register at the expense of the higher; that is, in order to produce "big tone," forcing a register *up* instead of bringing the higher one *down.* Especially with dramatic singers, this

fault is frequent. There is no voice, however strong it may be, which can endure this overstraining of the registers, and sooner or later the singer must experience the disastrous results of his or her fault —hoarseness, fatigue, roughness, and impureness in singing, and last, but not least, premature wearing out of the vocal organs.

The exaggeration of the registers is generally united with faulty breathing, which first of all must be corrected. Only after good results have been obtained with regard to breath practice, can exercises for the correction of the use of the registers be made with success.

When the fault consists in the exaggeration of the low register, the singing in this register must be avoided for some time; when both the low and middle registers have been used beyond their limit, exercises can at first be sung only in the high register.

The pupil, while practising (in the first case in the middle and high register, in the second only in the high register), must limit himself to a few tones, singing always downwards and very softly. The tones will be weak, husky, and often impure in the beginning; by and by, however, they will improve. When those few tones are pure and clear,

the pupil may extend the exercises downwards, always singing *pianissimo* and avoiding the lower register. The high and middle registers, or only the high register, must be extended downwards as far as possible. Only after all the tones, sung as indicated, are clear and pure and have gained sufficiently in strength, may the low or the low and middle registers be used again, but even then not more than is strictly necessary.

The extending downwards of a higher register is also an excellent help in smoothing out the break in the voice at the passage from one register to the other. This extending downwards of the higher registers always can be done without any danger to the voice. The "timbre" of the voice will even gain considerably in brilliancy and fullness by exercising in this way.

Closely united to the stretching and relaxing of the vocal ligaments is the moving up and down of the larynx. Many believe that the larynx must be kept as motionless as possible and in a low position. The large number of voices which have been spoilt by this unnatural fixed position of the voice-box are a manifest proof of the evil of this way of operating, against which every singer must be warned.

The larynx must be completely free in its movement, its positions varying according to each tone and to the pronunciation of each vowel. We can easily follow the movement of the larynx by laying the finger on the prominence in the throat formed by the junction of the two wings of the thyroid cartilage, commonly called "Adam's apple." When pronouncing successively "oo, ow, oh, ah, eh, ay, ee," we shall notice that the voice-box rises and inclines slightly backwards; and, while at "oo" its position is lowest, it is highest at "ee."

Also when singing upwards we feel the larynx going up, while the inclination backwards can be observed even better than when pronouncing the vowels. Especially when singing a high tone after a low one we can feel how considerably the position of the larynx changes, and it is clear that every obstruction in its movement hinders normal voice-production.

When examining the patient the physician should observe the action of the larynx and feel if there are no spasmodic movements and if the flexibility is satisfactory. The action of the larynx can be exercised and improved by singing seconds, thirds, etc. The keynote always may be sung on *oo;* the second, third, etc., on *ee.*

CHAPTER XI

MORE VOCAL HYGIENE

VOCAL hygiene is a specific system based upon well-regulated principles for a specific purpose and applying to a specific class in the family of nations. But there is the difference that, whereas the laws governing the general health of the community have legislative sanction and are strenuously enforced by official authority, the laws of vocal hygiene bear no seal of state or municipal power, save in the broadly general sense indicated, but rely for enforcement upon the individual who is most nearly involved, and who must pay swift penalty for any infringement, however slight and however innocently committed.

While this is a truism, yet it cannot be too strongly emphasized nor too often reiterated; for with all their notable precautions, singers are often taken unawares and fall when most they desire to stand. Why? They are simply paying the penalty of a broken law, and it does not help them with a disappointed club committee, or in framing a telegram of regret, accompanied by a physician's cer-

tificate, to say that they have erred through ignorance. The aphorism that ignorance of the law is no excuse is just as valid in the court of the hygienic judge as in any common law court between the oceans.

It is the prevalent practice to use the physician as the court of last resort. But it would be vastly better and far more sensible if the singer could be made to act with swift authority as an agent of prevention over the weaknesses of his or her own nature. The subject, thereby, would be vastly simplified. It would not be so profitable to the specialist; but I can vouch for it that he would not only forgive, but praise the discretion of his patient, and lend all possible aid to educate him along a new scientific path—that of prevention. Not a new path, either, for in its last analysis what is hygiene but the science of prevention? Preservation of health means the prevention of disease. This answers the cry of every artist's heart, especially that of the vocal artist, teacher and student: How can I prevent disease and weakness of the vocal machinery? Briefly and plainly: How can I keep well?

In this important matter of vocal hygiene a prominent part is played by the mucous membrane.

What is the mucous membrane? It is the membrane which in this special sense covers or lines the respiratory tract from the very outlet of the nose to the terminal bronchi; in fact, to the very air-cells of the lungs themselves. Its function is that of supplying the involved passages with moisture, and it secretes a glairy or watery substance called mucus. Now, mark this well. The entire area of the respiratory tract, from the nose to the bifurcation of the bronchi, it is said on good authority equals one square foot of exposed surface, and the amount of secretion per day equals about sixteen fluid ounces, or a pint, which must be secreted by a person in the normal condition of health. It also has the power of absorption of certain diverse substances, such as alkaloids, fluids of all kinds, hence the danger of alcoholic indulgence to the singer. Alcohol coagulates. It causes the epithelium to contract and to become so disintegrated as to be utterly incapable of performing its functions until such time as the underlying tissue shall have created new cells to take the place of those which have been destroyed. To illustrate briefly the varied functions of this membrane: Whereas alcoholic stimulant destroys it, another powerful drug, cocaine, is absorbed, often to such an extent that the

patient is prostrated by the poison introduced into the system by this means, and yet without impairing the membrane to any extent except through persistent indulgence.

The mucous membrane is the telltale of conditions. If a man's tongue is coated with detritus—which, anglicized, is nothing more than the products of decomposition, a coating formed by overstimulation of the glands lying at the base of the tongue—and this has been previously superinduced by a disordered stomach, we know that the cause is indigestion. If the follicles in the back part of the pharynx or throat appear distended, and even the tonsils themselves are affected—and these again are part and parcel of this same mucous membrane —we can say this is due to one of several causes: either to a reflex condition from the stomach, due to over-eating or over-indulgence of some other equally deleterious sort, or to inactivity of the bowels, or to suppressed perspiration, or to improper or undue use of the vocal organs.

Again, let us glance for a moment at what a good many people deem a superfluous appendage, the uvula. A patient comes into my office with a badly swollen uvula. The upper tones of the voice are gone. He has no complicating quinsy, and in

that case I can say without hesitation that he has outrageously misused his voice. I ask him where he was the previous afternoon, and find he was jubilantly "rooting" for the New York Giants in an exciting baseball contest. Now, it in nowise lessens the force of my illustration that this patient was not a singer and did not acquire, if you please, his swollen uvula in orthodox fashion. It is only a short time ago that a man came to me with a pronounced case of œdematous uvula, or swollen soft palate. He announced to me that he was no longer a tenor singer, although he had sung tenor for three years; that lately he had been persuaded that his voice was baritone; and, indeed, he had been singing, up to the time of coming to me, a baritone part in opera. It was this which brought him under my hand as a patient. He had changed his teacher, who had insisted that he was a tenor, within two months, and since that time had been under the instruction of the master who had declared that he was a baritone. I had known him for some time, and the only perceptible change to me in the voice was a decided tendency to cover and sombre the upper tones. Upon examination, the only thing abnormal was the condition of the soft palate and the surrounding tissue extending down both pharyngeal

pillars. The soft palate was swollen to nearly three times its original size and hung down upon the tongue. The symptoms he complained of were inability to sing above F, and all high tones were husky. The production of the upper tones was accompanied with considerable pain. An emollient gargle was given and, soon after, astringent applications; but in vain. It was necessary three weeks afterward to amputate the uvula. Within three weeks more the operation was demonstrated a success in that the upper tones were fully restored; but I leave the question with the teachers whether this operation would have been necessary had not this young tenor been drawn aside on the purely theoretical issue as to whether he was not a baritone instead.

In the case of one of New York's most experienced singers, it required two years of persistent effort on the part of both patient and physician to overcome the habits of a lifetime. The case is of general importance for the reason that the habits he had formed are more or less common to all of us, though perhaps not to such an aggravated degree. He was an inveterate smoker and a confirmed coffee drinker. These habits reflected themselves upon the poor, defenceless mucous mem-

brane, whose function was perverted as shown in the constantly congested appearance of the respiratory tract. I have seen this artist with congested vocal cords rehearse an oratorio in the afternoon at a public rehearsal and sing the same work in the evening at the regular concert performance, when, to use his own words, "I feel as if every note will be my last. I have no grip on my voice." It was a clear case of indomitable will and sheer physical strength carrying the singer over obstacles that even to my mind seemed well-nigh insurmountable. A cure was effected in this obstinate case simply by insisting upon observance of hygienic law. There is no better instance of efficacy of vocal hygiene than in the case of this man. The gradual reassertion of nature, as indicated by the clearing up of the inflamed mucous membrane of the nose, the thickened condition of the pharynx and the chronically congested cords, was an all-sufficient reward for anxious thought spent upon an important subject. You may ask what was the remedy in this case. It was simply advice given and heeded, together with needed incidental treatment. I cut off his coffee and cigars, not immediately but gradually. He had sufficient force of character to aid me by heeding the counsel. The result was a diminution

of secretion of the mucous membrane and a return to normal conditions.

Right here there is another phase of the situation to which I desire to call particular attention, not alone because of its vital importance to the singer, but also because of the danger to the unschooled student of neglect of what we ordinarily term a cold in the head in its first stages. By the first stage of the cold I mean that condition which obtains before the stage of secretion is arrived at, where the mucous membrane is being congested, where it is almost impossible to distinguish what is the highest point of normal stimulation under which the membrane may be expected to do its best work. This point may be aptly illustrated by comparison with a singer under perfectly normal conditions. Then, as is well known, it is the mental impulse that stimulates nerve, muscle and membrane to do their best work. But in the other condition this result is attained without the mental impulse, as we have the mucous membrane and the blood-vessels carried to a temporary climax of effectiveness due to the systemic disturbance. By this I wish to make clear my point, that artists have often noticed an unusual brilliancy of voice under circumstances which were all the more mysterious because of the sudden col-

lapse of the vocal organ under stress of use, and the alarming suddenness of the catastrophe which overtakes them and leaves them totally incapacitated. Then they say, "I have a cold;" whereas it requires from twenty-four to thirty-six hours for the fulfilment of these conditions. They should have reached this sensible conclusion just two days before. I take issue with those physicians who urge that certain exercises should be given to the artist when the vocal cords are in a state of congestion, for the reason that it requires a period of from ten to fourteen days for the complete relief of this inflammation. During that period, the blood-vessels are fully employed absorbing the products of the inflammation, and any attempt to interfere with this necessary process of nature can end only in disaster or in a prolongation of the difficulty. This is the law of pathology, unalterable and not to be evaded. Physicians at times resort to soothing and astringent applications in an emergency, to carry the artist through a performance; but the lack of edge to the voice for weeks following is an all-sufficient indication of the revenge nature takes for this trespass upon her domain.

The cause of the sudden disaster to the voice which I have described is not far to seek. The cold

has caused over-stimulation of the mucous membrane of the larynx, and a consequent loss of voice. This cold begins in the head, and on the third day, perhaps before, it has attacked the larynx. Why? Because the mucous membrane has become so swollen that the nasal passages are obstructed and the mucous membrane of the larynx has to perform a double function, that of heating the air as it is brought to the lungs in the process of respiration, as well as carrying out its own obligation to the scheme of nature. By a strange coincidence, this membrane of the larynx is supplied with sensation by the same nerve that conveys motion to one of its tensor muscles. This is the superior laryngeal nerve. By the thickening of the mucous membrane, all the intrinsic muscles of the larynx are interfered with, and, consequently, total extinction of the voice follows swiftly upon excessive inflammation. There you have it in a nutshell. The mucous membrane of the larynx and the bronchial tubes, to enlarge upon its duty for a moment, is endowed with very fine, hair-like processes called cilia, whose action is to waft secretions from the interior of the lungs outward. Hence the danger of promiscuous spraying with all sorts of everyday nostrums, or of anything which may interfere with the activity of

these minute bodies or the media in which they operate.

This intimate relation of nerve and muscle and mucous membrane is best illustrated by the sneeze. The explanation of this is an over-stimulation of a part of the mucous membrane of the nose called the Schneiderian membrane. If we analyze the sneeze, we find that it simply consists of a spasm of the pharynx, larynx and diaphragm through the reflex action of this membrane. The over-stimulation of the membrane, in the case of the singer especially, may generally be set down to an incipient cold; but any inflammation of this part of the mucous membrane of the nose alone may give rise in reflex action to vocal disability.

There are some peculiarly interesting isolated instances of disturbance of the vocal mechanism, which are unique in that, while apparently harmless and uninteresting from the standpoint of even the specialist, they have, on occasions, developed most alarming influence over the voice. They have no precedent; experience alone can determine their influence for evil. They are not a matter of record, they are simply études, interesting studies in the bypaths of vocal hygiene, and must be dealt with as they appear. An exceptional example was one

wherein the voice of the singer was perfectly even except as to the G sharp in the medium, which was entirely wanting—as though it had never existed.

The singer in question came to me after an Easter rehearsal. I tried her voice with the E-scale before using the laryngeal mirror, and to my utter surprise found the medium G sharp missing, while all the rest of her scale was perfect even to the G sharp above. This experiment was tried repeatedly with the vowels *a, e, i, o,* and *u,* and with consonants prefixed, but invariably with the same result. Upon examination, no deviation from the normal anatomy was found, save in the left anterior nostril. Here a sharp spur of bone projected from the septum into the turbinated tissue. This condition had remained in this singer for four years, according to my previous observation, without causing her any inconvenience. A similar condition was seen by me in the case of Mr. Santley, the famous English baritone, when I made an examination, and he declared that he was not aware of its producing even discomfort—such a capital illustration of the necessity for non-interference until the laws of reflexes are disturbed, that I cannot refrain from alluding to it.

In my patient, however, in addition to her nasal

trouble, I found an enlarged follicle about the size of a pea back of the posterior pillar of the pharynx, at the junction of posterior pillar and pharynx. This follicle was removed by a simple process, when, as if by magic, the G sharp responded and has since remained unimpaired. My explanation of this case is simply one of reflex action; that is, by a singular complication this follicle fell in the track of the glosso-pharyngeal, the pharyngeal-plexus, the external-laryngeal and the recurrent laryngeal nerves, which, as it were, sounded the alarm for retreat of the phonating muscles whose harmonious action was necessary to produce the medium G sharp.

There are numerous instances of affections of the vocal cords that might be cited, all superinduced by straining the voice from various causes, but especially by using the voice under improper physical conditions or of singing in rooms filled with foul atmosphere.

CHAPTER XII

NODES AND THEIR CURE

I USE the scale of E as a means of revealing to the ear points wherein the voice shows signs of failure. I use this scale because within it lie all the principal resonances involved in voice-production. By this I mean that somewhere between the interval G♯ to C♯ an oral resonance is developed in the majority of voices. This seems to be coincident with the action of the lips, the tongue and the soft palate, and the other muscles that go to increase or to decrease the size of the oral cavity. From C♯ to E above middle C the principal changes occur which contribute to the development of the nasal resonance. Some rare voices, however, continue their oral resonance as high as F♯ before changing. It has occurred to me so often in the course of my practice that a peculiarly apt reason exists for making E the foundation-note of the test-scale employed in the operating room, that I lay particular stress upon it. It has seemed the most easeful note for the patient to sound, whatever his vocal condition, and I have been tempted to call it the "nature

tone," because it may be said to sing itself. At least, it can be sounded with naturally open throat and without calling into perceptible use the multiplied enginery of muscular forces which are required for the formation of the higher tones of the scale.

Consider for a moment this enginery of muscular forces at the command of the singer, and which his intelligent and ripe knowledge must guide. The muscles used in voice-production may be divided as to action and location into ten groups. In these ten groups there are one hundred and seventeen individual muscles. Three of these act alone. One hundred and fourteen act in pairs, making fifty-seven pairs. Again, these muscles are controlled by nerves, some of which act alone and others in combination. In one instance, a single nerve presides over two large groups of muscles. Then, in still another instance, two separate nerves are required to control the action of one small group—the palate group. The distribution is as follows: Single muscles, 3; muscles in pairs, 114; groups of muscles, 10; nerves acting alone, 17; nerves acting with others (eight groups), 88.

By taking these figures and increasing them in arithmetical progression, it is possible to calculate

what a multiplicity of nerve and muscle effort is involved in a sneeze. Everything that appertains to the vocal mechanism is spasmodically involved at once, and the enormous sum total of muscle and nerve movement, individualized, is 465,120. This shows how absurd is the theory of conscious control of the machinery of voice-production. As I have frequently pointed out, the adjustments of the vocal tract to the tone to be produced are responses to the will, physical reflexes of the tones which the singer hears mentally; so that voice is mental audition converted by responsive physical adjustment into audible tone.

Teachers and singers are aware that wrong methods of tone-production result in nodes on the vocal cords. The node, therefore, is one of the most familiar forms of vocal catastrophe.

In its simplest form the node is a superficial swelling on the edge of a vocal cord, sometimes appearing on one and then on the other and ofttimes on both, dependent entirely upon causation. For instance, the cause might be simply a severe spell of coughing, and this, of course, might befall a person who was not a singer at all. It has been known to occur to animals. The node is, in fact, an œdema or dropsy, a swelling from effusion of

watery fluid in the cellular tissue beneath the skin or mucous membrane. This œdema appears on the edge of the vocal cord, as a slight tumor or swelling filled with water. If aggravated by continued use of the voice, it may develop and become exceedingly dangerous, by extending inward to the real tissue of the cord itself. The membrane is thickened by the watery secretion, and much the same thing happens as in the case of a pinching bruise or a blistering burn. Nature's cure for this state of things is by absorption of the fluid contents and a consequent diminution in the size of the node until finally a normal condition of the cord is restored and the voice returns in all its fullness. In the formation of the node it is worth remarking that the coughing node may appear at any point on the cords. It shows first at one point and then at another. The node caused by vocal weakness or abuse of the natural powers, however, displays an exasperating, and sometimes puzzling, affinity for particular portions of the vocal cords. It is generally found protruding from the anterior and middle third on one or the other side of the glottic opening, or on both, in chronic cases. The other nodes may be found at any place on the cord. In fact, it frequently happens that the coughing node,

and what for convenience may be styled the "vocal node," are simultaneously present, each to be distinguished by its well-defined location, although produced by totally different causes.

There are cogent reasons for the affinity of the vocal node for certain fixed positions on the cords. They can be explained by the trick of the vibrating string and bit of paper. If the paper is laid upon the string at a certain point, it will be flirted away; while at another chosen point it will slip unagitated to the floor. Inasmuch as the vocal cords are subject to the same laws of vibration, the lesson drawn from the string and the bit of paper applies to them, the node taking the place of the paper. Note, however, the difference. The string is single, and there is no attrition. If there were two strings, the bit of paper might be caught and twisted in the miniature whirlwind of opposing vibrations. But the vocal cords are wedded in phonation, and by their attrition the node is formed. Very often strands of tough mucus appear spanning the chink or slit between the cords when they are drawn up in tone-production. The presence of these bands of mucus is an assured precursor of the node. Often they indicate the existence of a node which is hardly perceptible through the laryngeal mirror.

The mucus is nature's effort to relieve the attrition, and so to ease the inflammation at the point of difficulty. The obstinacy with which the nodes caused by vocal disaster thus form in the anterior and middle third of the cords may be explained as owing to the presence in the vocal cords of a point which may be called the centre of resistance for the intrinsic muscles, and indicates that they are caused, in the majority of cases, by undue and improper muscular effort in tone-production. Consequently, the necessity for the most painstaking care on the singer's part to avoid singing under unfavorable conditions. A trifling over-exertion at an afternoon rehearsal in a cold hall, too much talking on the train, a bad night's rest in a sleeper berth, all may conspire to weaken the voice for the time and lay it open to attack. Under such circumstances, particularly, it is necessary for the vocalist to exercise large discretion and to aim for a conservative middle course, and especially so in a preliminary rehearsal.

Another cause of the node is a lack of cordal coördination. Were the human form perfect, both cords would be equally strong. As a matter of fact, in my own experience, I have found that the major portion of nodal formations appear on the left

cord, indicating that it is the weaker. The fact that one cord is slightly lax while the other vibrates at full tension along its face causes trouble. Another source of difficulty is subglottic, owing to inflammation of the mucous membrane in the trachea, which extends upward and involves the cords. The inflammation, passing upward, may easily affect the voice. Such inflammation is discovered by a tickling sensation in the trachea, causing a dry, harsh cough about the third day after a cold has found lodgment "in the head," as the phrase goes.

The node has been the cause of vocal catastrophe from opera houses to concert halls, yet a reasonable amount of precaution will minimize the chances of attack. Singing in a room where there is smoking is a prolific source of node formation. Breathing dust-laden air, continued effort to carry on conversation on the cars or amid street noises, are fruitful causes of vocal disorder.

The mucous membrane of the vocal cords obeys natural laws in restoration. A node may disappear in three days, if not teased with effort. More often, however, it requires from seven to ten days for it to disappear without treatment. If the singer foolishly persists in using the voice, the node will extend into the cord tissues, and result in a most un-

fortunate condition. The cord loses its elasticity. It refuses to respond. It will neither act nor will it consent to be acted upon. It is in a state of collapse, and the voice for singing purposes has gone, never to return.

Let me illustrate what rest will do for a node. A singer came to me with a node of three months' standing, on the left cord. She had been singing with her teacher in the regular course of her lessons at an unfortunate time, when, too, she was vocally weak. In singing up the scale, and at the C (as nearly as she could remember), she became hoarse, and, as she described it to me, "the voice had a hole in it." Throughout the remainder of the lesson, unless she exercised great care, she would always break at the point named. Her nose seemed stuffy, and she compared her nose and throat to a cornet lined with velvet. After the break, and for the remainder of the lesson, her voice was husky. Her teacher advised her to seek expert advice. Previously, the voice had been clear, though she was a novice in singing. After remaining away from her lessons for two weeks or more and finding that recovery was not rapid, she came to me. The node could be plainly seen on the left cord. Before examining her, I tried the voice with

the E scale, wrote down the diagnosis and handed it to her to read. My written conclusions were verified with the laryngeal mirror. I found no trouble except with the left vocal cord, the node being in the anterior middle third. On the summit of the node the mucous membrane appeared very red, budded, and almost warty. I cocainized the cord, and immediately applied pure alum in solution to the node itself, but to no purpose. This treatment was continued for two weeks, without any perceptible change for the better. Then I ordered the patient to remain quietly in a closed room; she was to see no one, she was not to talk at all, she was not to laugh. As harassing as was the experience, she faithfully observed the directions, and on the fourth day every vestige of redness had disappeared. Only a slight elevation remained on the cord where the node had been. The treatment was continued three days longer. At the expiration of that period no trace of the node could be seen. Now no one would suspect that a node had once affected her voice. Experiences like this indicate why I counsel against use of the voice under diseased conditions.

As a general proposition, all throat spraying is dangerous. A New York singer, suffering while

on a concert-tour from a case of sub-acute laryngitis, sought advice from a physician who honestly tried to aid him, but shot wide of the mark through injudicious use of a spray, in which he used menthol and eucalyptus, a combination much affected by a certain well-meaning class, and which for a time gives to the throat a delightful sense of coolness. The singer became afflicted with a violent, explosive cough, which caused the formation of a node. He gave up singing, losing nearly $1,000 in engagements. He went to his own room and to bed. He remained in his room for three weeks. The temperature was carefully watched. He did not expose himself in the slightest degree, nor did he use his voice. The result was a perfect cure.

Another case is that of a church singer whose throat during a religious festival service became filled with the smoke of incense. The irritation caused a troublesome cough, and she lost her voice entirely above the top F♯. It required fourteen days to effect a cure. She stopped singing for six days and then sang in church, with the result that the difficulty returned, augmented. She sensibly rested the succeeding week and perfected a cure. Rest did far more than any amount of medicine, however it might have been administered.

Paralysis of the vocal cords constitutes a second form of vocal catastrophe. It should need no definition. In reality, however, the paralysis does not lie in the cords themselves, but in the leading muscles that control in phonation. There are many forms of this particular example of vocal catastrophe, though I am now dealing only with those which are liable to attack a singer, and which are most frequent in my own experience.

With the singer one form is common, viz.: paralysis of the left adductor muscles, or those which inspire the arytenoid cartilage in drawing the left vocal cord forward to meet its fellow for the production of tone. No one can ever forget the sight presented by the left cord in its helpless condition: the arytenoid, tipped with its cartilage of Santorini, extending far over the median line of the glottis and drawing after it the right vocal cord in a vain endeavor to put it in position where it can aid its injured mate.

The paralysis may, of course, occur on both sides, and then it is that, on the side which is most exercised, there is felt a sense of distress, of pain and sudden fatigue. This condition generally arises from prolonged singing, and many of the cases I have seen have been the result of overwork

during Easter and Christmas; and all of the cases which have come under my observation were associated with rheumatic constitutions. Fortunately for these singers, when the conditions were made known to them, they were in a position, or at least were perfectly willing, to rest, because of the fear that a knowledge of their condition instilled. Indeed, the situation is always one to cause serious alarm. The beautiful symmetry of the arytenoids is impaired and the agility of the voice is destroyed. If the singer persists in his vocation, total disability results. As a rule, complete rest is enforced by reason of inability to sing at all. If the voice is continued in use, the affection becomes permanent and there is one more case of irremediable vocal collapse. The remedy is rest, and that, too, before the disease has passed recoverable ground. If the singer experiences pain on either side of the thyroid cartilage, or on either side of the Adam's apple, then let him by all means have a care, for those are the symptoms of this peculiarly menacing form of paralysis. In the voice a palpable hoarseness is manifest. The voice becomes "fuzzy" throughout its entire compass. A pronounced disability to make a *crescendo* arises, and when the effort is made (for in the described circumstances

use of the voice is attended with undue effort), the tone becomes coarse and uncontrollable. The range of the voice is lessened and the singer finds difficulty in reaching the upper tones. In the general debilitation the singer tries, or rather is compelled through weakness, to poise the voice from the cords themselves and not from the diaphragm.

Of the other forms of vocal-cord paralysis there is one of great interest, known as hysterical paralysis. It is usually only temporary, and is sometimes produced in singers whose nervous condition grows upon itself until the system passes into the trying disturbance diagnosed by the rudely critical public as "stage-fright." Artists of marked pretension have been compelled to abandon a public career because of this affliction. There are other examples of it even more difficult to understand. I have in mind a case of a singing-teacher in a conventual school, who was under a peculiar strain of preparation for the commencement exercises of the school and of her own class and their appearance in public. She brought her class up to the appearing-point. Then her nervous system gave way, and when she came to me she was absolutely voiceless. Sometimes in coughing her vocal cords could be seen to move. With rest she recovered, but she has a

recurrent tendency to the same trouble every year. The case would seem to illustrate the uselessness of all effort on the part of the person so affected permanently to overcome it. The remedy is at hand, however, in numerous cases, in resort to a careful and uninterrupted upbuilding of the nervous system.

I will mention some other cases of vocal disorder and cure. An operatic tenor came to me with a tendency to break in scale-sounding, and with a nasal or catarrhal color to all his tones above E. I found attached above and back of the soft palate a mass as large as a hickory nut and completely blocking up the dome of the pharynx. A little cocaine was applied, and with a single sweep of the curette he was minus an adenoid on the third tonsil, a tonsil of Luscha. Within ten days his voice was completely restored.

Sometimes the physician is obliged to seek far for the cause of catastrophe to the voice. A fine and thoroughly well-trained tenor singer came to me with a singular tremor in his voice. The entire scale was tremulous. I found nothing the matter with any part of his vocal tract save that, on closely studying the condition of his mouth, there was a rapid muscular contraction of the soft palate and

surrounding tissues. This led me to examine him from head to foot for possible nervous disorder, of which, however, I found no trace. Then, satisfied that there must be a more remote physical cause, I pushed the examination further and discovered traces of kidney affection. He was successfully treated for this and, with its cure, his voice also was restored. This case shows the close relationship between parts of the physical constitution and the voice, and illustrates the importance to the singer of a generally healthy physical condition.

Another case illustrates a further and somewhat peculiar phase of the subject. From the posterior nasal passage of a singer I removed nine large adenoid tumors. He was a tenor, and within a few days his upper tones were perceptibly freer and fuller. He had recently changed his instructor; and subsequently I found that he was attributing to this teacher the marked improvement in his voice. The physician was receiving no credit as a voice-builder whatsoever from either of them—which shows that in addition to a keen knife, the specialist should also possess a keen sense of humor.

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